Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

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LUDLOW GRISCOM

Vol. 35. May, 1933. No. 413.

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The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Room 1001, 53 State St., Boston, Mass.

RHODORA.—**A monthly journal of botany, devoted primarily to the flora of New England. Price, $2.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) 20 cents. Volumes 1–8 or some single numbers from them can be supplied only at advanced prices which will be furnished on application. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be considered for publication to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.**

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Subscriptions (making *all remittances* payable to RHODORA) to Ludlow Griscom, 8 W. King St., Lancaster, Pa., or Museum of Comparative Zoology, Cambridge, Mass.

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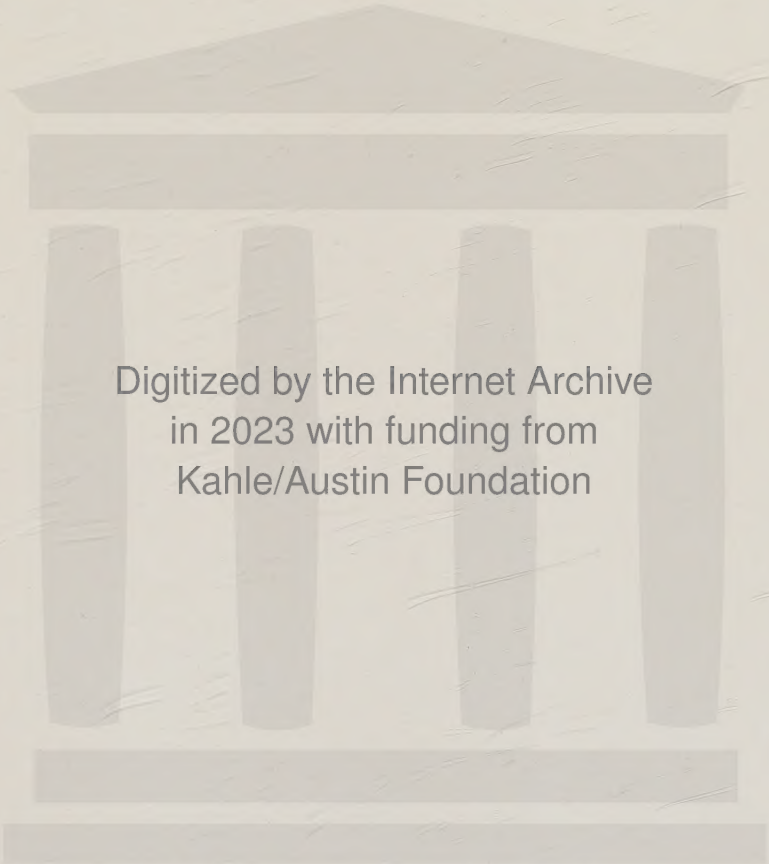

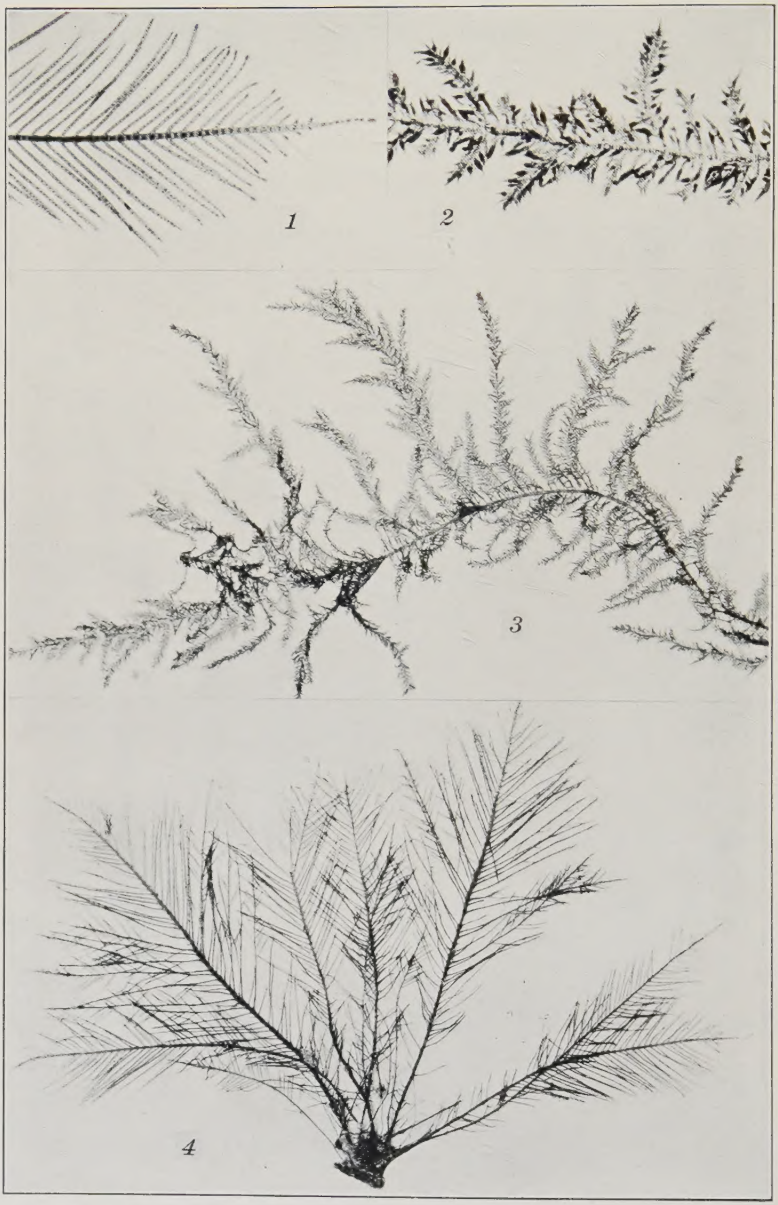

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 35. May, 1933. No. 413.

NOTES FROM THE WOODS HOLE LABORATORY,—1932[1]

I. F. Lewis and W. R. Taylor

(Plate 274.)

The David Starr Jordan Algae from Penikese Island.—A small package of specimens of marine algae was found at Stanford University, annotated as being from Penikese Id. and collected by Dr. Jordan, presumably during the time he spent there at the Agassiz laboratory (Alexander School of Natural History). Through the kindness of Prof. G. M. Smith they were sent to the writers at the Marine Biological Laboratory for study and deposit. When seen by Prof. B. M. Davis, he recognized the specimens as some which he had found among Jordan's materials after the Penikese visit, and had annotated as to collector and station. In view of the prominence attained by the collector, and the fact that they probably represent the evidence underlying part of his earliest scientific work, they acquire a special significance. Like almost all algal collections of the period (*ca.* 1873) the specimens are very small, but in nearly every case remain in determinable condition. While the writers' verdict as to species represented does not always coincide with the name inscribed on the mount, few alterations in the published list are suggested thereby.[2]

The specimens number over 40 groups, though a considerably lower number of species. It would be idle to record here changes in specific

[1] Printed with aid of a grant to Rhodora from the National Academy of Sciences. Plate 274 is numbered out of sequence in the volume owing to the long series of consecutive plates in the continued paper upon Newfoundland.

[2] Jordan, D. S. The flora of Penikese. American Nat 8: 193–197. Apr. 1874.

assignment or in synonymy which do not affect the published lists.[1] Apart from such, some items seem to call for special mention. The following were found present in the collection, although unreported or erroneously named, by Jordan. On sheets originally labeled *Gelidium corneum* though corrected in pencil, appeared *Lomentaria uncinata* Menegh. There is a record of *G. corneum* in the 1874 list, but it is not authentically reported from the district. Originally labeled *Griffithsia corallina* and in pencil *G. Bornetiana* was material properly designated *G. globulifera* Harv. The specimens originally labeled *Polysiphonia nigrescens* were sorted into that species, *P. urceolata* (Dillw.) Grev. and *P. atrorubescens* Grev. Of the original collection *P. affinis* and sundry other mislabeled specimens seem to be *P. violacea* Grev., which name has but recently been brought into question.[2] This does not appear to be an appropriate place to assume the nomenclatorial changes involved, so the familiar practice is retained. A mixture, primarily *Antithamnion cruciatum* (C. Ag.) Naeg., with *Callithamnion roseum* (Roth) Harv. and *C. corymbosum* C. Ag., was originally labeled *Antithamnion americanum.* The specimens of *Chondriopsis tenuissima* were the slender plant often called *Chondria Baileyana* (Mont.) Harv. The specimen of *Phyllophora Brodaei* is more correctly *P. membranifolia* (G. & W.) J. Ag. The specimens of *Ceramium diaphanum* were all *C. fastigiatum* (Harv.) Ag., although the former is certainly to be expected on the island; *C. arachnoideum* proves to be simply a small *C. rubrum* (Huds.) C. Ag. Only *Lomentaria uncinata, Polysiphonia atrorubescens* and *Callithamnion roseum* are additions to the recorded flora, as they appear neither in the 1874 or 1924 lists.

It is not possible absolutely to exclude names from the list on the basis of changes in assignment of the specimens received, because this collection is far from complete, and a considerable number of Jordan's names, including some doubtful ones, are unrepresented by specimens. However, the presumption against the presence of *Gelidium corneum* and *Griffithsia corallina* is strengthened; the other names confirmed as incorrectly used are of plants already known to be found at Penikese, or which may reasonably be expected. There remains a residue of species reported by Jordan which are to be

[1] Lewis, I. F. (Edit.). The flora of Penikese, fifty years after. Rhodora **26**: 181–195, 211–219, 221–229. Oct., Nov., Dec., 1924.

[2] Tandy, G. Notes on phycological nomenclature, I. Jour. of Bot. **69**: 225–227. 1931.

expected, but were not found among his specimens nor in the 1924 collections. Of eight mentioned in the 1924 paper as the most notable among these, three have recently (1931) been collected: *Enteromorpha clathrata* (Roth) Grev. (L. M. Perry), *Cladophora gracilis* (Griff.) Kg. (C. Moore) and *Callithamnion Baileyi* Harv. (B. Andrew).

If time could be given to thorough collecting on the island more effective completion of the list might be expected, but as the visits are always made in the interests of groups of as yet inexperienced students, the "finds" are more by accident than design. Material of *Trailliella intricata* Batters (H. T. Croasdale) and *Asparagopsis hamifera* (Hariot) Okam. have also been secured, probably recently introduced in the course of their spread in the Buzzards Bay district. As early as 1925[1] there was secured on Penikese an alga, at first indeterminate, later described as *Acrothrix novae-angliae* Taylor, which during 1926–1927 became more abundant, and which has persisted as an occasional element of the flora of the district. Since this note attempts to assemble records supplementary to the 1874 and 1924 lists, four other species should be mentioned. In the herbarium of one of the writers (W. R. T.) there appears a specimen of *Scinaia furcellata* (Turn.) Bivona purporting to have been collected on Penikese Id. 31 July 1890 by S. Burrage, received in a distribution from W. A. Setchell. In the general catalog of the algae of the Woods Hole area B. M. Davis[2] lists a few algae from Penikese stations, including *Dictyosiphon hippuroides* (Lyngb.) Aresch., *Agardhiella tenera* (J. Ag.) Schmitz, and *Polyides rotundus* (Gmel.) Grev., which seem otherwise unrecorded. *Myriotrichia clavaeformis* Harvey (W. R. Taylor) was found in abundance upon Scytosiphon at Penikese 8 July 1930.

Penikese Lichens of the 1924 Survey.—A few lichens were collected by the mycological squad during this survey, but no account of them was available at the time report was made. Ultimately a list of determinations made by the late Prof. Bruce Fink was kindly transmitted by Dr. C. W. Dodge. The 20 collection numbers cover 10 species, all still represented by one number in the Fink lichen herbarium at the University of Michigan, the complete series being at the Farlow Herbarium, Harvard University.

[1] Taylor, W. R. A species of Acrothrix on the New England coast. American Jour. Bot. **15**: 577–583. 1928.

[2] Davis, B. M. General characteristics of the algal vegetation of Buzzard's Bay and Vineyard Sound in the vicinity of Woods Hole. Bull. (U. S.) Bur. Fisheries **31** (1): 443–544, (2): 795–833. 1913.

Cladonia coniocraea (Floerke) Spreng. On soil.
Cladonia fuscata (Huds.) Spreng. On soil.
Cladonia symphycarpa (Ach.) E. Fries. On moss over soil.
Lecanora allophana (Ach.) Nyl. On bark.
Lecanora Hageni Ach. On granite.
Parmelia caperata (L.) Ach. On trees.
Parmelia sulcata Tayl. On trees.
Ramalina calicaris (L.) E. Fries. On branches.
Physcia stellaris (L.) Nyl. On bark.
Xanthoria parietina (L.) T. Fries. On trees.

Changes in the Woods Hole Algal Vegetation.—The interval since the preparation of the last series of Notes[1] has seen curious shifts in the incidence of certain notable elements of the flora. The behavior of *Trailliella intricata* is especially remarkable. First coming to our attention in 1927, it increased in abundance and largely replaced *Spermothamnion Turneri* (Mert.) Aresch. in its favored habitats, and consequently as a dominant element in the algae drifted ashore over large stretches of the coast at certain periods. The writer believes that he noted a marked reduction in the abundance of Trailliella in 1931, extended in 1932, and the future of the genus will be watched with great interest. If it parallels that of *Acrothrix novae-angliae* it may continue to decrease until the plant is rare. The later species, first detected 1925, became frequent at certain station in 1928, but by 1931 was again a rarity, though still found as occasional specimens and in 1932 became abundant cast upon the Ganset Tract beach during a brief period. Trailliella, presumably an introduction, reached a really prominent position in the flora, while Acrothrix, described as native, did not do so. The history of *Dumontia filiformis* (Fl. Dan.) Grev. and *Asparagopsis hamifera* (Hariot) Okamura is still one of increase, the former being a substantial floral element on certain shores in early summer, while the latter is no longer an extreme rarity and the plants found are far larger and better developed than those originally reported and figured,[1] although extremely tangled types of growth are also found. It was abundant at Penikese Id. in 1932. The curious large Myxophycean introduction, *Brachytrichia Quoyi* (Ag.) Born. & Flah., continues to be sporadic. Abundant at Scraggy Neck in 1920, after several years of unsuccessful search it appeared again in abundance in the late summer of 1930 (H. T. Croasdale) at one of its old stations (Hadley

[1] I. F. Lewis and W. R. Taylor. Notes from the Woods Hole Laboratory—1928. Rhodora **30**: 193–198. 1928.

Harbor, Naushon Id.), repeating in very small quantity in 1931. No changes in the longer-known flora have been as marked as in these just mentioned, although *Lomentaria rosea* (Harv.) Thuret, after several years of great rarity, has become frequent (1930–1931–1932) on wharves at Woods Hole and Menemsha Bight, as well as dredged about the Devil's Bridge. *Fucus platycarpus* Thuret, from holding an obscure place has become an abundant and constant feature upon the rocks, usually nearer the high tide line than *F. vesiculosus* L.—W. R. T.

New Records of Marine Algae.—Two very extraordinary records were established during a dredging trip taken to the neighborhood of Devil's Bridge, off Gay Head, Marthas Vineyard, Massachusetts, on the 8th of July, 1931. The first of these concerns *Tilopteris Mertensii* (Sm.) Kg. (Plate 274, fig. 2, 3). One larger piece 6 cm. in length, and few smaller pieces were secured. The material was in good condition, abundantly branched and with very numerous and characteristic monosporangia. This appears to be a new record of this plant and of the family (Tilopteridaceae) to which it belongs, since no record of any representative of the family in America is known to the writer. The plants grew in relatively shallow water, accompanied by *Hildenbrandia Prototypus* Nardo, *Sphacelaria plumigera* Holmes, Schizonema colonies of diatoms, and other algae. The stones were dredged abundantly and discarded in the field, excepting a few pieces kept for the Hildenbrandia or other obvious algae. The presence of the two novelties was not noted until close examination took place in the laboratory, and probably much more material was thrown away.

The second novelty is determined as *Sphacelaria plumigera* Holmes, (Plate 274, fig. 1, 4) with some caution in view of the sterile state of the specimens. Associated with Tilopteris, several small pieces were detatched from a few stones remaining from large hauls chiefly discarded in the field. The branching and general features of the plant lead one to expect to place it among *S. plumigera, S. plumosa* or small *Chaetopteris plumosa.* The second is eliminated as a possible name, since in that species the cortical cells are not transversely subdivided, as was the case in our material. The choice between the other two was hard to make, in the sterile state and considering the possibility of its representing juvenile Chaetopteris. The decision rests mainly on structural features developed in Sauvageau's monograph.[1] It

[1] Sauvageau, C. Remarques sur les Sphacelariacées. Jour. de Bot. **14, 15, 16, 17, 18.** 1900–1904. Continued as separate publication, completed 1914.

appears that in fertile condition separation is easy, since sporangia occur on the primary ramuli in the Sphacelaria, and only on ramuli from the rhizoidal outer cortex (somewhat as in Cladostephus) in Chaetopteris. Lacking fruit, an effective vegetative character appears in the manner of origin of the rhizoids which form the cortex. In *S. plumigera* (Sauvageau v. **15**, p. 111–116, fig. 22d) all the rhizoids are formed in the plane of the distichous ramuli, and while they later envelope the axis, at first its upper and lower faces are naked. In *C. plumosa* (Sauvageau v. **15**, p. 144–149) they appear indiscriminately all about the axis from the beginning, and seem also to form a heavier and firmer cortex. Again, in examining the margins of the basal disk-like hapteral portions of these species one finds that *S. plumigera* has cells from one-half as long as wide to equal in this respect (Sauvageau v. **15**, fig. 22a), while in Chaetopteris these marginal cells are longer than broad, to twice as long (Sauvageau v. **15**, fig. 24a). In both of these distinctive features, as in more intangible matters of aspect, the Devil's Bridge plants clearly resemble *S. plumigera*, and this is apparently a first record of the plant for America.

In addition to the description in Sauvageau's paper, the writer was able to confirm his opinion by comparison with the specimen of *S. plumigera* in his copy of Traill's list of Firth of Forth algae[1] and Kattegat material collected by Børgesen, with a few European specimens of *C. plumosa*, and American material of a plant once referred near *S. plumosa* (*S. californica* Sauv.). At a late stage in this study the writer received from Prof. H. P. Bell material brought to him from Prince Edward Island by Miss Constance MacFarlane, and correctly determined as *C. plumosa*. The piece seen by the writer was very small, but in rhizoid character conformed to Chaetopteris, and the cortex bore some old sporangia in the correct position for that genus. Chaetopteris has been recorded[2] from the American northwest coast, from Prince Edward Island and northward, and from Greenland as well as northern Europe.—W. R. T.

Disappearance of Zostera in 1932.—It was evident to many biological observers along the coast of New England that in 1932 *Zostera marina* L. was strikingly reduced from its normal abundance.

[1] Traill, Geo. W. A monograph of the algae of the Firth of Forth, illustrated with herbarium specimens of some of the rarer species. Publ. for Author, pp. 16 + 1, 8 spec. Edinburgh, 1885.

[2] Farlow, W. G. The marine algae of New England. Rept. U. S. Comm. Fish & Fisheries of 1879. Appendix A-1: 1–210. 1881.

Usually forming vast meadows in many areas, and present in some quantity nearly everywhere that suitable conditions of bottom offered, one was tempted to consider it quite absent from many of its most productive habitats. A report from Nova Scotia indicates that a similar situation has prevailed through the Maritime Provinces, the plant usually almost eliminated, with occasional areas showing a sparse growth and small areas without obvious loss. On the Maine coast about Lamoine known meadows were bare. Chatham Bay on Cape Cod, the whole Falmouth and Woods Hole district, well known meadows about West Falmouth and Sconticut Neck in Buzzards Bay; also the Elizabeth Islands to Cuttyhunk and Penikese Islands, areas on Marthas Vineyard, in many cases verified by personal observation of the writer, were nearly or quite depopulated. Practically no living *Zostera* was brought ashore by the wash; even heavy surf from an early September gale, which would have loosened much in Buzzards Bay, had there been any significant growth, cast up only occasional fragments. From the Cold Spring Harbor area information comes that at several stations, and on both sides of Long Island (N. Y.) similar conditions prevailed. While a report suggests that about Wildwood, N. J., little change in the *Zostera* growth was to be noted there, observations in Chesapeake Bay and on the nearby coast are emphatic that the *Zostera*, which is normally very abundant, was very seriously reduced, being (from June and onward) represented by scattered blades in areas usually densely covered, and with no marked reappearance during the season. Finally, as the southernmost source of information, a report from Beaufort, N. C. indicates distinct scarcity there, which in some spots was partially overcome late in the summer.

These are necessarily fragmentary observations (at least as summarized here)[1] of so great a coast line, but they point to a phenomenal disturbance in the whole marine sublittoral biological situation, because in the absence of this plant a notable list of animals are unable to find their preferred, or even their only suitable, attachment place, spawning ground, or food. Reports from zoölogists are quite striking in this respect. The industrial use of *Zostera* for insulation and packing materials, and as a dressing for fields in agriculture, is also intermitted. No reasoned suggestions as to the cause of the disturbance

[1] Information from A. G. Huntsman, H. P. Bell, D. B. Young, W. S. Schmitt, H. T. Croasdale, S. I. Kornhauser, H. G. Richards, R. V. Truitt, H. F. Prytherch, and others, is gratefully acknowledged.

are offered here. It appears that the plant reappeared (very scantily, indeed) in some of the denuded areas during the summer, and that the rhizomes were sometimes still present under the mud in the old meadows, intact, and perhaps viable. It is certain that in no considerable area did the plant, remaining dormant during early summer, reappear to full luxuriance by September.—W. R. T.

Explanation of Plate 274

Fig. 1. Sphacelaria plumigera, tip of axis showing distichous ramuli, × 18.5; fig. 2. Tilopteris Mertensii, portion of small branch showing ultimate ramuli with monosporangia, × 16.5; fig. 3. Tilopteris Mertensii, portion of main axis showing habit, × 3.2; fig. 4. Sphacelaria plumigera, portion of plant showing habit, × 7.1.

THE DISTRIBUTION OF IRIS VERSICOLOR IN RELATION TO THE POST-GLACIAL GREAT LAKES[1]

Edgar Anderson

In connection with a study of geographical differentiation in two species of Iris (Anderson 1928), an attempt has been made to work out their distribution in as great detail as possible. While the survey is not yet completed, it gives promise of contributing useful evidence as to vegetational changes in glacial and post-glacial times.

Iris versicolor is a northern species, its distribution being roughly that of the northern coniferous forest. *Iris virginica* is a southern species which spreads up from the Gulf and the southern coastal plain to Virginia, Ohio, southern Michigan, and central Minnesota. At the western limits of their ranges, where the transition between northern coniferous forest and deciduous forest is a sharp one, the range of *Iris versicolor* coincides exactly with that of the white pine (*Pinus Strobus*). Figure 1. is compiled from my own collections and from records very kindly sent me by Prof. F. K. Butters of the University of Minnesota and by Prof. N. C. Fassett of the University of Wisconsin. It shows the western distribution of *Iris versicolor* in relation to that of the northern forest. Eastward, in Michigan, Ontario and Ohio, where the boundaries of the northern forest become less clearly defined, the ranges of *Iris versicolor* and *Pinus Strobus* show greater deviation though they are still essentially the same.

[1] Contribution from the Univ. of Mich. Biological Station. Published with aid of a grant to Rhodora from the National Academy of Sciences.

A very similar situation has been reported by Butters (1927) in his careful study of the varieties of *Maianthemum canadense*. He finds that in Minnesota the two varieties of Maianthemum are so sharply separated that they might be considered as good species were it not for the fact that they have become hopelessly intermingled along the Atlantic seaboard.

Fig. 1. Distribution of Iris versicolor (open dots) and Iris virginica (solid black) in Minnesota and Wisconsin. The irregular black line marks the approximate southern limit of the coniferous forest.

Although *Iris versicolor* and *Iris virginica* occupy very different ranges, they are found, one in the north and the other in the south, in almost exactly the same situations. They occur along the borderlines of swamps in the transition zone where it is too dry for *Typha* and too wet for grasses. So characteristically are they found in such situations that Gates in his studies of plant associations in Northern Michigan (1926) has named this transition zone the "Iris association."

In the rare cases where their ranges overlap, both species are found

growing side by side in the same wet pasture or along the same interdunal swamp. *Iris versicolor*, to be sure, shows its northern heritage in that it flowers earlier and ripens its fruits more quickly than does *I. virginica*. In those parts of Michigan where the two species grow together their blooming periods barely overlap. If there is any apparent difference between the requirements of the two species it is that *I. versicolor* is more tolerant of occasional drying out and can continue to flower and fruit in situations where *I. virginica* will only persist vegetatively.

In Michigan the habitats of the two species are particularly similar. Both in the northern and southern parts of the state there are numerous "tamarack swamps" filling poorly drained hollows left by the last glaciation. They seem to be fundamentally the same plant-association in all parts of the state, yet in the northeastern third of the peninsula, *Iris versicolor* is found about the swamp margins while in the south and west *I. virginica*, and never *I. versicolor*, is found in the same relative position.

Why should we find *Iris virginica* all the way from the gulf northwards, in cypress swamps, willow thickets, floodplain lakes, wet prairies, and sphagnum bogs, only to have it completely replaced by another and very similar species in the northern coniferous forest? Must it not be that the main reasons for the present distributions of the two species are historical rather than edaphic; that we find one in the northern Michigan swamps and the other in southern Michigan swamps, not because there is any great difference between the two situations but because one species has come in from the north in company with a whole northern flora and that the other has spread in from the south? It furthermore seems quite possible that neither species has moved about a great deal locally since it first entered the region. The one natural mode of travel of each species is by water. Their seeds and rootstocks float readily and are often found establishing themselves on marshy spots along lake and river beaches. There seems little possibility of spread by other means. The seeds are too large and heavy to be blown about. The rootstocks are acrid and poisonous and would seldom be carried by animals.

For the above reasons it was thought that the present distribution of the two species might quite accurately reflect ancient vegetational changes. A careful study of their exact distribution in northern Michigan was made in July 1931. Previous work had shown (Ander-

son 1928) that *Iris virginica* is found south of a curved line running from Tawas City, Michigan to Traverse City, Michigan, and that *Iris versicolor* occurs from there northwards. The 1931 field work confirmed this distribution with one surprising exception. As is shown in FIGURE 2 there is a large irregular area at the very tip of the peninsula where *Iris virginica* is found almost exclusively.

This anomalous distribution of *Iris virginica* is related in no apparent way to soil conditions or climatic factors. Douglas Lake and Munro Lake, for instance, are only one mile apart. Yet swampy land along the former is colonized by *Iris virginica* while in exactly the same relative locations on the edges of Lake Munro, *Iris versicolor* is common and prolonged search failed to reveal a single plant of the other species. Most of the situations in which *Iris virginica* is found in this area are ancient beaches of the glacial and post-glacial Great Lakes. Since both *Iris versicolor* and *I. virginica* are found coming up today along marshy beaches of the modern Great Lakes, it seemed possible that there might be some correlation between the distribution of the two species and the shore lines of these ancient lakes.

FIGURE 2 shows how very logical their distribution becomes on that assumption. Lake Algonquin, the last of the glacial lakes, persisted some time in the region and cut strongly marked beaches by which its extent can be accurately determined (Leverett and Taylor). These beaches show that in Algonquin time, northern Michigan was an archipelago of islands as is shown in FIGURE 2. Today those parts of the region which were then above the waters of Lake Algonquin are populated with *I. versicolor*. Throughout this whole area only one small plant of *Iris virginica* has been found above the Algonquin beaches and it was growing in a roadside ditch. *Iris versicolor*, on the other hand, occurs in profusion around Lake Munro and Lark Lake and in smaller quantitites at several other points.

Below the Algonquin Beach line the situation is reversed. *Iris virginica* is found by the hundreds of thousands of plants and *Iris versicolor* is found only immediately below the Algonquin beaches, in situations where it might easily have been washed down from above, or as an occasional plant here and there along the roadside. The water level fell from the Algonquin to the Nippissing stage by a series of intermediate steps, leaving many abandoned interdunal swamps. In these swamps *Iris virginica* is found in enormous numbers. Around French Lake it occurs by the acre; in all the swamps

around Douglas Lake it is common and in some of them is accociated with other southern plants such as Silver Maple (*Acer saccharinum*).

Near the edge of the Jack Pine Plains, a few miles south of the town of Indian River (on Burt Lake) is a wet meadow so similar to such formations in the south that one can find no better term to use in describing it than savannah. This interesting locality was discovered

Fig. 2. Distribution of Iris versicolor (open dots) and Iris virginica (solid black) in the Douglas Lake region. The heavy black line represents the Algonquin beaches and the cross-hatched areas were above the waters of Lake Algonquin. The chain of dots represents the beaches of Lake Nippissing.

by Dr. J. H. Ehlers who has reported (1921) on the surprising occurrence there of the distinctively coastal plain species, *Panicum virgatum* L. var. *cubense* Griesb. Along the small stream which drains the area *Iris virginica* grows rampantly, its flowers borne nearly shoulder high. As one stands in the midst of the little savannah, surrounded by *Iris virginica* and *Panicum virgatum* var. *cubense*, and with the Jack Pine too far in the background to reveal their specific identity . . . it is hard not to believe that one is in the

Carolinas instead of at the edge of the Jack Pine Barrens of northern Michigan.

Fig. 3. Distribution of IRIS VERSICOLOR and IRIS VIRGINICA in the southern peninsula of Michigan. The wavy black line represents the approximate southern extent of the northern types of forest.

From the Nippissing level the Great Lakes fell to approximately their present level. Along the interdunal swamps of the intermediate levels both species are found, though *Iris versicolor* is apparently the more common.

Since *I. versicolor* is prevailingly a northern and *I. virginica* a characteristically southern species one might suppose that during warm eras *Iris virginica* would be brought to the lake beaches while during colder periods *Iris versicolor* would predominate. On these assumptions the present distribution of the two species would indicate; I. That in Algonquin time the mainland and the archipelago were clothed with a northern vegetation. II. That the waters fell from the Algonquin level during a time when the climate was much warmer, perhaps even warmer than it is at present, as evidenced by the almost complete absence of the northern species of Iris from the beach swamps of that period.

If these conclusions are confirmed by the pollen analysis studies of Michigan bogs already under way (Sears, 1930), the distribution of *Iris virginica* and *Iris versicolor* may prove useful in studies of glacial and post-glacial vegetation. The southern limit of *Iris versicolor* in Michigan (FIGURE 3) seems, for instance, to be correlated with the interlobate morraine of the last glaciation. Does this perhaps mean that *I. versicolor* persisted in the tundra vegetation of the interlobate region during the end of glacial times and that in the warm period following the retreat of the ice the regions previously covered by the Saginaw and Lake Michigan lobes were colonized by southern species?

In addition to the regions mentioned above, the two species meet in southern Ontario, north-eastern Ohio, to a certain extent at least along the Great Lakes-St. Lawrence system in New York, and on the Atlantic Coast. I shall be glad to assist anyone who may be interested in following up the minutae of their distribution in these regions.

ANDERSON, EDGAR 1928. The problem of species in the northern Blue Flags, *Iris versicolor* L. and *Iris virginica* L., Annals Mo. Bot. Gard. **15:** 241–332.

BUTTERS, F. K. 1927. Taxonomic studies in the genus *Maianthemum*. Minn. Studies in Plant Science **6:** 429–444.

EHLERS, J. H. 1921. RHODORA **23:** 200.

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ARNOLD ARBORETUM.

RECENT DISCOVERIES IN THE NEWFOUNDLAND FLORA

M. L. Fernald

(*Continued from page 140*)

Agropyron § Goularda in Eastern North America.—With four recent monographic studies of North American *Agropyron* one would suppose it possible to place our few plants of this group with relative satisfaction. In 1897 there appeared Scribner & Smith's extensive *Native and Introduced Species of the Genera Hordeum and Agropyron;*[1] in 1905 Piper's brief but critical *Agropyron tenerum and its Allies;*[2] in 1910 Pease & Moore's *Agropyron caninum and its North American Allies;*[3] and in 1932 Malte's *The so-called Agropyron Caninum (L.) Beauv. of North America.*[4] All four papers are the result of close study and careful consideration but if we accept the conclusions of one of the revisions we find ourselves at odds with the others. The genus is notoriously difficult and individual judgments as to specific and varietal lines are bound to differ; consequently, no one treatment can now be worked out which will be wholly satisfactory to all students. In the area best known to me, the region from southern Labrador and Newfoundland to New England and the Great Lakes, the genus has its great development in eastern North America; and assiduous collecting (nearly 300 numbers) of it and close study of its complexities, both in the field and in the herbarium, during a period of forty-five years have given me a bowing acquaintance with the group which makes it difficult to follow, without some divergence, any of the four revisions above noted.

The greatest discrepancies are found in the treatments of § *Goularda*, the nonstoloniferous group of which *Agropyron caninum* (L.) Beauv. is typical. As Malte clearly shows[5] (pp. 28–30), true *A. caninum* of Eurasia is quite a different species from the long-awned plant of North America which has erroneously passed for it. Abundant herbarium material supports this decision, so that the primary premises of Pease & Moore's revision, that our plant is *A. caninum* and that such very different plants as *A. latiglume* (Scribn. & Sm.)

[1] Scribner & Smith, U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 23–36 (1897).

[2] Piper, Bull. Torr. Bot. Cl. xxxii. 543–547 (1905).

[3] Pease & Moore, Rhodora, xii. 61–77 (1910).

[4] Malte, Nat. Mus. Can. Ann. Rep. for 1930, 27–48, plates 1–5 (1932).

[5] Earlier students, Beal and others, had doubted the occurrence of *A. caninum* in America; and in 1900 Scribner (in Brainerd, Jones & Eggleston, Fl. Vt. 9) implied that we do not have it.

Rydb. and *A. tenerum* Vasey are merely variations of it, lose much of their force. The North American counterpart of the Eurasian *A. caninum*, the plant (PLATE 244, FIGS. 1–4, and MAP 18) with long awns, occurring generally from Newfoundland and eastern Canada to New England and Pennsylvania, thence across the continent, is *Triticum subsecundum* Link (1833), the type of which is illustrated by Malte (his plate v), while its very large extreme (our PLATE 244, FIGS. 5–7 and MAP 19), with glumes, lemmas and often the awns longer, is *A. Richardsoni* Schrad. (1838) or *A. unilaterale* Cassidy (1890), not *A. unilaterale* Beauv. (1812). Scribner & Smith, Hitchcock (in Gray's Manual) and Rydberg all maintain the two latter (*A. "caninum"* and *A. Richardsoni*) as distinct species; Pease & Moore as different varieties; and Malte treats them as strictly identical!

Agropyron Richardsoni and the so-called *A. caninum* of North America sometimes overlap in their characters, but the former has a distinctive disruption of geographic range which suggests that it is not merely a selected series of overgrown individuals. Whereas *A. "caninum"* (MAP 18) is a common or frequent plant of either calcareous or non-calcareous ledgy and gravelly shores and dry woods and thickets from eastern Newfoundland to Pennsylvania, thence westward to the Pacific, the coarse *A. Richardsoni* (MAP 19) is decidedly localized east of the Great Lakes: confined to the St. Lawrence system eastward to Gaspé and Anticosti, chiefly in calcareous soils. Therefore, *A. Richardsoni*, with a distinctive geographic range and in its typical development with clearly recognizable morphological characters, is, it seems to me, at least a good geographic variety.

Malte, agreeing in principle with Pease & Moore, treats *Agropyron tenerum* Vasey (PLATE 243, FIGS. 1–3), including both *A. pseudorepens* Scribn. & Sm. (PLATE 243, FIGS. 4–6) and *A. novae-angliae* Scribn. (PLATE 243, FIGS. 7–9), and North American *A. "caninum"* (PLATE 244, FIGS. 1–4) including *A. Richardsoni* (PLATE 244, FIGS. 5–7) as one polymorphic species; but, having demonstrated that the North American plant is not the Eurasian *A. caninum*, he correctly takes up for the aggregate-species of North America the next available name, *A. trachycaulum* (Link) Malte (1932), based on *Triticum trachycaulum* Link, apparently overlooking the fact, however, that the same combination under *Agropyron* was made by Steudel in 1854 and was repeated by Candargy in 1901.

The type of *Agropyron trachycaulum*, illustrated by Malte, is exactly *A. tenerum* Vasey (1885), but, again agreeing with Pease & Moore,

Malte merges with it two plants, *A. pseudorepens* Scribn. & Sm. and *A. novae-angliae* Scribn., which in eastern America are much more widely dispersed than typical *A. trachycaulum*. True *A. trachycaulum* or *A. tenerum* (PLATE 243, FIGS. 1–3 and MAP 15) (also *Triticum pauciflorum* Schwein. (1824)) has very slender and elongate spikes, with the tightly appressed spikelets scarcely imbricated, the tips of most of them failing to reach the spikelet next above (on the same side); many of the internodes of the rachis strongly quadrate, with all four sides deeply concaved, the middle internodes mostly 0.8–2 cm. long; glumes coriaceous or subcoriaceous, with hyaline border 0.4–0.6 mm. broad and the closely embraced rachillas (PLATE 243, FIG. 3) usually only scabrous or appressed-pubescent. This plant, true *A. trachycaulum* or *A. tenerum*, is widely dispersed in western North America, from southern Alaska to California, thence eastward to the more western of the Great Lakes; east of Minnesota and adjacent Ontario and Wisconsin it is represented in the extensive eastern collections in the Gray Herbarium only from limestone cliffs, slopes and gravels near the Gulf of St. Lawrence in eastern Quebec: Anticosti and the Mingan Islands, the Gaspé Peninsula and Bic.

The other plants merged, without any indication of doubt by Pease & Moore (except that they separated the shorter-spiked specimens of *A. pseudorepens* as *A. caninum*, var. *Hornemanni*) and, again, by Malte, with true *A. trachycaulum* (*A. tenerum*) usually have dense spikes of well-imbricated and less closely appressed spikelets; the internodes of the rachis usually not strongly quadrate but with convex or corrugated backs and commonly 2 (instead of 4) ciliate edges; the middle internodes short; the glumes inclined to be more herbaceous and narrowly margined (hyaline margins only 0.1–0.4 mm. broad); the free rachillas commonly villous (with loosely spreading pubescence). These plants with denser spikes appear in two well marked geographic trends. The first of these (PLATE 243, FIGS. 4–6 and MAP 16) is prevailingly calcicolous, occurring very generally from southern Labrador and the lower St. Lawrence to southern Maine on limy soils or on the margins of the sea or in brackish or saline marshes. Inland it is more inclined to take to the upland, occurring (as *A. caninum*, var. *Hornemanni* Pease & Moore) in the subalpine and alpine (not always calcareous) regions of Maine and New Hampshire. It next appears on the north shore of Lake Superior and extends thence across the calcareous plains westward, where it is known as

A. pseudorepens. This plant has comparatively dense spikes, in maturity (in fruit) averaging 7 mm. in diameter, in anthesis much thicker, and with glumes averaging 12.5 mm. long. As stated, the shorter-spiked members of this series were called by Pease & Moore *A. caninum*, var. *Hornemanni* and many botanists have identified them with *A. violaceum* (Hornem.) Lange, based upon *Triticum violaceum* Hornem. Malte clearly shows, however, that the name *Triticum violaceum* was a *nomen confusum* which should be rejected, while *T. biflorum*, β. *Hornemanni* Koch, involved in the typification of *A. caninum*, var. *Hornemanni*, was, by description, *A. latiglume* (Scribn. & Sm.) Rydb., an arctic species with unkeeled and broad-margined broadly oblong to narrowly obovate glumes and pubescent lemmas, which is unknown in eastern North America south of northern Labrador.

The other dense-spiked plant with villous rachillas, merged by Pease & Moore and now by Malte with typical *Agropyron trachycaulum* (*A. tenerum*), is *A. novae-angliae* (PLATE 243, FIGS. 7–9 and MAP 17), characterized by its slender spike (in maturity averaging only 5 (3–6) mm. in diameter), with the glumes averaging 8 (5–10) mm. long and the lemmas proportionally small. *A. novae-angliae* passes into *A. pseudorepens*, which in turn merges into *A. trachycaulum*, but in its typical form *A. novae-angliae* in the East is a plant of low altitudes and usually on neutral to acid soils (either rock, gravel or wet peat) from northern Labrador to the granitic hills of southern New England, thence westward. In general, then, while typical *A. trachycaulum* in eastern America is confined to the limestones bordering the Gulf of St. Lawrence in Quebec, *A. pseudorepens*, also chiefly calcicolous, has a wider eastern range, from southern Labrador to southern Maine and northern New Hampshire; and *A. novae-angliae*, chiefly of neutral or acid soils, extends into the cooler parts of southern New England.

Although very different in their extremes, all these plants seem to pass, as Pease & Moore and, later, Malte have independently maintained, into one another.[1] In their best developments, however, they all have rather distinct geographic ranges, at least in eastern America; and I find myself looking upon them as reasonably defined geographic

[1] The late Charles Walter Swan, an unassuming but wonderfully close student of New England grasses, left many suggestive notes on specimens he studied. On one of *A. trachycaulum*, var. *glaucum* ("*A. caninum*"), collected at Willoughby in 1898, he wrote: "Cut off the awns and compare. Why, 'violaceum' [*i. e. novae-angliae*]."

varieties. It does not seem satisfactory to submerge as identical with *A. trachycaulum* (*A. tenerum*) such pronounced variations as *A. pseudorepens* and *A. novae-angliae;* nor does it seem any more satisfactory to treat as strictly identical *A. Richardsoni* (*A. unilaterale*) and the smaller "*A. caninum.*"

All or nearly all of our varieties of *Agropyron trachycaulum* may have green or more or less glaucous or glabrous or more or less pubescent phases. These usually occur without appreciable geographic segregation (often in closely adjacent colonies), and long experience in the field has abundantly demonstrated that such variations may be expected throughout the ranges of any of the major or primary varieties. Pease & Moore, following what seems the more logical method in such cases, treated them as *formae*, this being the procedure which for several years the more progressive systematists have been adopting. Thus, the late Otto Holmberg, whose regrettable death has left unfinished the most scholarly of Scandinavian floras, treated such minor tendencies as forms, reserving the varietal category for stronger variations, with notable differences in size of parts or with morphological differences and somewhat definite ranges: *Festuca ovina*, f. *hispidula* and f. *laeviflora*, but var. *vivipara* and var. *duriuscula; F. rubra*, f. *glaucescens* and f. *planifolia*, but var. *commutata* and var. *oclandica; Agropyron repens*, f. *pubescens*, but var. *maritimum;* etc. In general, I have for some years been trying to follow this procedure and so have Blake, Eames, Weatherby and others in America. Malte, discussing such variations, concludes that "all variations of the same nature ought to be considered as equals, i. e. ought to be conceded equal taxonomic rank and value." As pure logic, wholly dissociated from the actual vagaries of Nature, this may be conceded; but, surely, when applied in classification, the logic often fails; characters which in one group are of great taxonomic importance in another may prove wholly unimportant and to be a series of nonconcomitant and unresolvable variables.

In the present case I find myself unable to follow my friend, Malte, in treating selected plants with "at least" a trace of pubescence on the old shrivelled basal sheaths, persisting from last year's new vegetative shoot, as true varieties on a par with variations so strong that they are often considered good species: such phases of the long-awned plants as his *Agropyron trachycaulum*, vars. *ciliatum* and *glaucum* or of the awnless plants as his vars. *trichocoleum* and *Fernaldii*. Nor can I

treat as coordinate with the true geographic varieties (which Scribner & Smith, Piper, Hitchcock and Rydberg have treated as full species) the more or less glaucous individuals (Malte's *A. trachycaulum*, vars. *glaucescens*, *Fernaldii*, *caerulescens* and *glaucum*), minor tendencies which differ from the green individuals only in having more wax on the surface. By drying these over heat or by immersing them in hot water *A. trachycaulum*, var. *glaucescens* becomes the green plant (*A. violaceum*, var. *majus* Vasey); var. *Fernaldii* becomes the green var. *trichocoleum* and vars. *caerulescens* and *glaucum* promptly become their greener counterparts.

As a matter of fact, furthermore, authentic specimens of two of these so-called "varieties" from the same locality are so nearly indistinguishable that only by the closest examination can one detect that they may possibly have been collected from different clumps. *Agropyron trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte, based on *A. caninum*, var. *tenerum*, f. *Fernaldii* Pease & Moore, is a slightly glaucous phase with "At least the lowest sheaths pubescent." Its designated type was collected by *John Macoun*, no. 68,978, at Cap à L'Aigle on "August 8," 1905 (in Gray Herb.) and as identical with it Pease & Moore cited another collection in the Gray Herbarium from Cap à l'Aigle, "*J. Macoun* . . . no. 68979," with the date (on the label) also "Aug. 8th, 1905." Unfortunately, Pease & Moore made a slight but confusing error, for Macoun's no. 68,978 (their type) has the date on the label (in Macoun's hand) "Aug. 24th," instead of "August 8," as cited by them. The two sheets look like young material (no. 68,979, labelled "Aug. 8th") and over-ripe material from the same colony (no. 68,978, labelled "Aug. 24th") and the transposition of the date would be of little consequence had not Malte included no. 68,979 as one of the three known collections of his new *A. trachycaulum*, var. *glaucescens* which is distinguished from his var. *Fernaldii* only by having "Sheaths glabrous." The type of var. *Fernaldii* (no. 68,978) has all the cauline leaves and sheaths quite glabrous but, when diligently searched for, two or three of the marcescent old sheaths at the base of the plant, but by no means all, show some pilosity. The younger material (no. 68,979) from the same locality, which Malte puts into a second of his varieties because it has "Sheaths glabrous," shows, likewise, in the material sent by Macoun to the Gray Herbarium, very definite pubescence upon some of the new basal offshoots. The treatment of such trivial individual divergencies (in these cases

AGROPYRON TRACHYCAULUM: FIG. 1, inflorescence, × 1, from TYPE collection of *A. tenerum;* FIG. 2, inflorescence, × 1, from Quebec; FIG. 3, internode of rachilla, closely embraced by lemma. × 10.

Var. MAJUS: FIG. 4, mature (closed) inflorescence, × 1, from TOPOTYPE of *A. pseudorepens;* FIG. 5, young inflorescence, × 1, from Newfoundland; FIG. 6, internodes of rachilla, × 10.

Var. NOVAE-ANGLIAE: FIG. 7, young inflorescence, × 1, from type-region, Willoughby, Vermont; FIG. 8, ripe inflorescence, × 1, from Massachusetts; FIG. 9, internodes of rachilla, × 10.

AGROPYRON TRACHYCAULUM, var. GLAUCUM: FIG. 1, inflorescence, × 1, from the TYPE: FIG. 2, inflorescence, × 1, from TYPE of var. *caerulescens;* FIG. 3, inflorescence, × 1, from TYPE of var. *pilosiglume;* FIG. 4, internode of rachilla and base of lemma, × 10.

Var. UNILATERALE: FIG. 5, inflorescence, × 1, from Anticosti; FIG. 6, inflorescence, × 1, from Montana; FIG. 7, internode of rachilla and base of lemma, × 10.

with lack of apparent divergence) as true varieties does not seem wise, and their recognition as anything but visible but taxonomically unimportant departures from a theoretical type does not seem worth while. At any rate, such slight ecological or physiological responses are not comparable with the varieties which show strong departures in characters of the spikelets, in habitats and in ranges, departures so pronounced that several agrostologists have considered them true species.

In § *Holopyron*, represented in eastern America by species with elongate rootstocks, there is less difference of opinion. All recent authors are agreed as to the distinctness of *Agropyron dasystachyum* (Hook.) Vasey, *A. Smithii* Rydberg, *A. repens* (L.) Beauv. and the American representative of *A. pungens* (Pers.) R. & S (PLATE 245, FIG. 5). In recent years *A. pungens* has been called by some European botanists some kind of hybrid: by Ascherson & Graebner *Triticum junceum* × *repens;* by Rouy *A. junceum* × *littoreum;* by Holmberg *A. litorale* × *repens*. Now, a species (PLATE 245, FIG. 5), thoroughly consistent in all its characters and clearly matching European *A. pungens*, is indigenous at the sea-margin, on shingly beaches, sand dunes and borders of salt marshes, from Cape Breton to Cape Cod, the plant described from the Maine coast as *A. tetrastachys* Scribn. & Sm. It is a thoroughly typical element in the flora of this district, along with *Puccinellia maritima* (Huds.) Parl., *Festuca rubra*, var. *juncea* (Hackel) Richter, *Carex maritima* O. F. Mueller, *Polygonum Raii* Bab., *Suaeda maritima* (L.) Dumort., *Lathyrus japonicus* Willd., vars., and other maritime species which share the European and the American shores of the North Atlantic. Yet neither *Agropyron junceum*, *A. littoreum* nor *A. litorale* is known on the coast of northeastern America. Under the circumstances, with *A. pungens* a constant member of our maritime flora, it seems inevitable that it should be maintained as a true species.

Without overloading the present paper with needlessly detailed descriptions, the leading diagnostic characters of the eastern American species of *Agropyron* of both sections, as I now interpret them, may be briefly summarized in the synoptic key which follows. Since there has been much confusion in the group (especially in § *Goularda*), sufficient specimens in that section (preferably of numbered exsiccatae which will be mostly represented in numerous herbaria) are cited to render my interpretation perhaps intelligible to others. The spikes of

characteristic specimens of the different species and varieties in § *Goularda* are shown, life-size, in PLATES 243 and 244.

For the loan of several types of Vasey and of Scribner & Smith I am indebted to the great kindness of Professor A. S. Hitchcock; for the loan of the type of *Triticum pauciflorum* Schwein. to Dr. Francis W. Pennell; and for material possibly representative of Cassidy's views to Professor Ernest C. Smith.

KEY TO THE SPECIES OF AGROPYRON IN EASTERN NORTH AMERICA

a. Spikelets not strongly flattened, at maturity readily disintegrating, the individual florets promptly disarticulating, leaving the persistent glumes: inner face of fruit flattish or broadly concaved: culms solitary or loosely to densely cespitose, without elongate rootstocks. § GOULARDA (Husnot) Holmb. Skand. Fl. pt. 2: 269 (1926). . . . *b.*

b. Anthers 1–2.5 mm. long, at most ⅓ as long as the lemmas: lemmas awnless or with essentially straight and ascending awns. . . . *c.*

c. Glumes flat or slightly convex, scarcely keeled, herbaceous or submembranaceous, oblong to narrowly obovate, with hyaline margin 0.5–1 mm. broad: lemmas pubescent: spike 3–13 cm. long: plant arctic or subarctic with us . . . . . 1. *A. latiglume.*

c. Glumes keeled, subcoriaceous to herbaceous, linear-lanceolate to elliptic, with hyaline margin 0.1–0.6 mm. broad: lemmas glabrous (rarely scabrous): spikes 0.4–2.5 dm. long: plants of temperate regions. . . . . 2. *A. trachycaulum.*

b. Anthers 3 mm. long: lemmas with strongly arched-divergent long awns. . . . . 3. *A. spicatum.*

a. Spikelets strongly flattened or 4-sided, at maturity dropping intact from the rachis, the individual florets not readily detached: anthers at least ½ as long as the lemmas, 3–6 mm. long: inner face of fruit deeply channeled: culms solitary or tufted: rootstocks very elongate and extensively creeping. § HOLOPYRON Holmb. l. c. 273 (1926). . . . *d.*

d. Lemmas and rachillas densely villous to lanate. . 4. *A. dasystachyum.*

d. Lemmas and rachillas glabrous to scabrous. . . . *e.*

e. Glumes linear-attenuate, tapering with straight margins from below the middle: spikelets 7–13-flowered: cartilaginous band of upper nodes of culm shorter than thick. . . . . 5. *A. Smithii.*

e. Glumes lanceolate to oblong, gradually curving to tip from above the middle: spikelets 3–7 (in the maritime no. 6, –11)-flowered: cartilaginous band of upper nodes of culm as long as thick.

Spike nearly square in section: internodes of rachis thick, usually 4-angled: spikelets 7–11 (very rarely only 3–5)-flowered: glumes coriaceous, with broadly rounded keel and ribs: leaves hard, very glaucous, mostly involute, with remote coarse ribs: top of culm solid (closely filled with pith). . . . . 6. *A. pungens.*

Spike usually not conspicuously quadrate: internodes of rachis thin, rounded on the back, 2-edged: spikelets 2–7-flowered: glumes herbaceous, with slender keel and ribs: leaves soft, flat, with crowded fine nerves: top of culm hollow. . . . . 7. *A. repens.*

1. A. LATIGLUME (Scribn. & Sm.) Rydberg, Bull. Torr. Bot. Cl. xxxvi. 539 (1909). *A. violaceum latiglume* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. biflorum latiglume* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Cl. xxxii. 547 (1905). *A. caninum*, var. *latiglume* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 73 (1910).—An arctic species, extending south in eastern America only to LABRADOR: Rama, August 20–24, 1897, *Sornborger*, no. 263, as *A. violaceum*.

Agropyron latiglume belongs to an arctic and subarctic series, including the American *A. alaskanum* Scribn. & Merr. and *A. yukonis* Scribn. & Merr. and the Old World *A. mutabile* Drobov. The material from continental boreal America is as yet too scanty to make out the true status of all these reputed species.

2. A. TRACHYCAULUM (Link) Steud.—A highly variable North American species, represented in eastern America by the following five geographic varieties.

a. Awns wanting or very short, at most ½ as long as body of lemma.... *b.*

b. Glumes coriaceous or subcoriaceous, with hyaline margins 0.4–0.6 mm. broad: spikelets in ours scarcely imbricated, the tips rarely reaching the bases of those above (on the same side): internodes of rachis often strongly quadrate, with all 4 sides concave and winged, mostly 0.8–2 cm. long; the 2nd internode 0.8–1.5 mm. broad, 0.5–1.3 mm. thick: rachilla usually scabrous or strigose, tightly embraced.... Var. *typicum*.

b. Glumes herbaceous to subcoriaceous, the hyaline margin only 0.1–0.4 mm. broad: all or all but the lowest spikelets well imbricated: internodes of rachis shorter, mostly convex or merely corrugated on the back and with 2 narrow edges; the 2nd internode 0.3–0.8 mm. thick: rachilla usually villous, with spreading pubescence, free.

Glumes (excluding awns, when present) averaging 12.5 (10–16) mm. long: contracted fruiting spike averaging 7 (5–12) mm. thick.... Var. *majus*.

Glumes (excluding awns, when present) averaging 8 (7–10) mm. long: contracted fruiting spike averaging 5 (3–6) mm. thick.... Var. *novae-angliae*.

a. Awns nearly equaling to much longer than body of lemma.

Glumes averaging 9 (6–12) mm. long: awns of lemmas 7–20 mm. long: contracted fruiting spike (excluding awns) averaging 5 (3–10) mm. thick.... Var. *glaucum*.

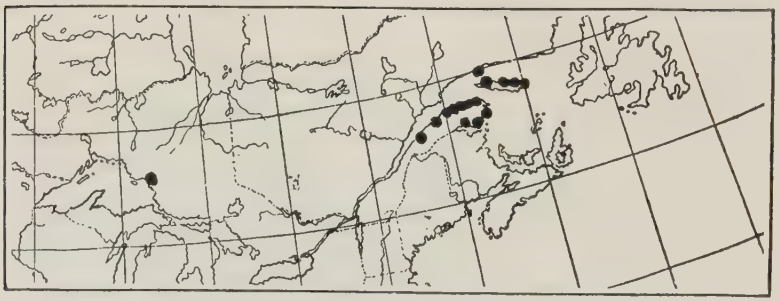
Glumes averaging 13.5 (12–18) mm. long: awns of lemmas 10–40 mm. long: contracted fruiting spike (excluding awns) averaging 9 (6–13) mm. thick.... Var. *unilaterale*.

Var. **typicum**. *Triticum trachycaulum* Link, Hort. Bot. Berol. ii. 189 (1833). *T. pauciflorum* Schwein. in Keating's Narr. Long's 2d Exped. ii. 383 (1824), not *A. pauciflorum* Schur (1859). *A. trachycaulum* (Link) Steud. Syn. Pl. Gram. i. 344 (1854);[1] Candargy, Étude Mon. Tribu Hord. 43 (1901), combination erroneously ascribed to

[1] For date of issue see Rendle, Journ. Bot. xxxvii. 33, 34 (1899).

A. pauciflorum (Schwein.) Hitchc.
Hitchc. Fern. Rhod. 36: 419, 1934.

"Host" (doubtless a misprint for "Hort"); Malte, Ann. Rep. 1930, Nat. Mus. Can. 42 (1932). *Crithopyrum trachycaulum* (Link) Steud. l. c. (1854). *A. tenerum* Vasey, Bot. Gaz. x. 258 (1885). *A. repens*, var. *tenerum* (Vasey) Beal, Grasses N. Am. ii. 637 (1896). *A. tenerum longifolium* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. pseudorepens magnum* Scribn. & Sm. l. c. 34 (1897), extremely large spikelets. *A. tenerum magnum* (Scribn. & Sm.) Piper, Bull. Torr. Bot. Cl. xxxii. 546 (1905). *A. caninum*, var. *tenerum* (Vasey) Pease & Moore, Rhodora, xii. 71 (1910). *Zeia tenera* (Vasey) Lunell, Am. Midl. Nat. iv. 227 (1915). *A. trachycaulum*, var. *tenerum* (Vasey) Malte, l. c. 44 (1932). Plate 243, figs. 1–3, and map 15.—Western North America, from southern Alaska to California, eastward to western Ontario, Wisconsin (perhaps introduced), Iowa and Missouri (introduced); limestone soils about the Gulf of St. Lawrence, Quebec. The following selected specimens



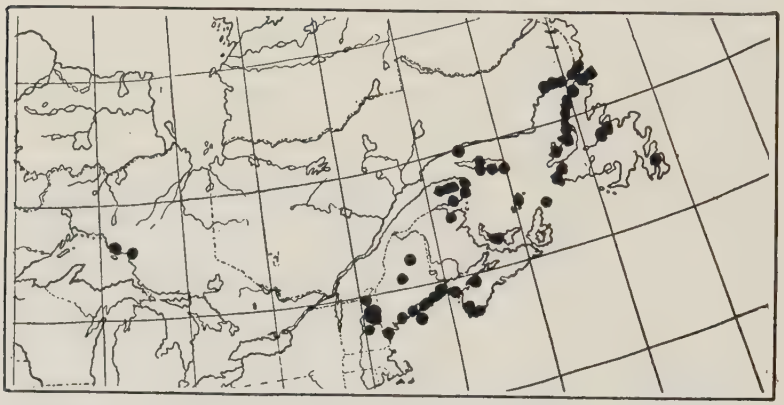
Map 15. Eastern Range of Agropyron trachycaulum, var. typicum.

(chiefly eastern) are typical. Quebec: sur les rivages calcaires, Grande Ile, Archipel de Mingan, *Victorin & Rolland*, no. 20,555; sur les platières calcaires, Riv. au Saumon, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 20,556; sur les alluvions près de l'embouchure de la rivière, Baie du Nord, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 20,588; sur les éboulis dans les gorges, R. Vaureal, Anticosti, *Victorin & Rolland*, no. 27,889; sur les bords de la petite rivière, Pointe de l'Est, Anticosti, *Victorin & Rolland*, no. 27,893; rivages calcaires, R. du Renard, Anticosti, *Victorin & Rolland*, no. 27,894; limestone-conglomerate talus, Mt. Ste. Anne, Percé, *Collins & Fernald*, no. 36; calcareous sea-cliffs between Mont Louis and R. à Pierre, *Fernald & Smith*, no. 25,465; Mt. St. Pierre, *Victorin, Rolland & Jacques*, no. 33,199; dry calcareous slaty talus of Mt. St. Pierre, *Fernald, Weatherby & Stebbins*, no. 2423; cobbly beach of Gulf of St. Lawrence, Cap au Renard, *Fernald & Pease*, no. 24,909; shore of St. Lawrence, Matane, August 3, 1909, *F. F. Forbes;* gravelly beach at Paspébiac Lighthouse, July 26, 1902, *Williams & Fernald;* gravelly beach, Tracadigash Point, Carleton, July 22, 1904, *Collins & Fernald;*

limestone-conglomerate cliffs and ledges, Cap au Massacre, Bic, July 16, 1904, *Collins & Fernald.* ONTARIO: sands at Pic R., July 30, 1869, *J. Macoun*, no. 175. WISCONSIN: Murphy's Railroad track, Green Bay, July 15, 1897, *Schuette.* MANITOBA: Emerson, July 17, 1887, *J. Fowler.* MINNESOTA: Garden Island, Lake of the Woods, *MacMillan & Sheldon*, no. 1353; Fort Snelling, *Mearns*, no. 780; Bridgeman, July, 1892, *Sheldon;* prairies, common, Montevideo, June 19, 1896, *Moyer;* Elmore, *Pammel*, no. 895; "Prairies of the St. Peter" [Minnesota R.], *Say*, 1823 (type of *Triticum pauciflorum* Schwein., in herb. Phil. Acad.). IOWA: Wheatland, *Ball*, no. 271; Ames, June 27, 1893, *F. C. Stewart;* Little Rock, *Ball*, no. 556. MISSOURI: rare, introduced along railroads, Sheffield, July 17, 1898, *Mackenzie*, no. 246, July 10, 1899, *Bush*, no. 142. COLORADO: Fort Garland, 1884, *Vasey* (type no. of *A. tenerum* Vasey, as designated by Piper, Bull. Torr. Bot. Cl. xxxii. 543 (1905))—form with very slender spike; near Empire, *Rydberg*, no. 2401 (type of *A. pseudorepens magnum* Scribn. & Sm., consequently of *A. tenerum magnum* (Scribn. & Sm.) Piper; in U. S. Nat. Herb.)—form with unusually stout spike. OREGON: along spring-runs in open places, near Grant's Pass, *Howell*, no. 256 (type of *A. tenerum longifolium* Scribn. & Sm., in U. S. Nat. Herb.).

Var. **majus** (Vasey), comb. nov. ?*A. violaceum, β. virescens* Lange, Consp. Fl. Groenl. 155 (1880). *A. violaceum*, var. *majus* Vasey, Contr. U. S. Nat. Herb. i. 280 (1893). *A. pseudorepens* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 34 (1897). *A. tenerum majus* Vasey ex Piper, Bull. Torr. Bot. Cl. xxxii. 543 (1905). *A. caninum*, var. *Hornemanni* Pease & Moore, RHODORA, xii. 73 (1910) in large part, but not as to name-bringing synonym, *Triticum biflorum β. Hornemanni* Koch, acc. to Malte, l. c. 38 (1932). *A. tenerum*, var. *pseudorepens* (Scribn. & Sm.) M. E. Jones, Contr. West. Bot. xiv. 19 (1912). *Zeia pseudorepens* (Scribn. & Sm.) Lunell, Am. Midl. Nat. iv. 226 (1915). PLATE 243, FIGS. 4–6, and MAP 16.—Chiefly in calcareous or subalkaline soils, southern Labrador (and ?Greenland) to southern British Columbia, south to coast of Maine, northern New Hampshire, Lake Superior (Ontario) Nebraska, Colorado, Nevada and Oregon. The following, selected from a large representation, are typical. LABRADOR: rocks, Forteau, *Fernald & Wiegand*, no. 2690. NEWFOUNDLAND: edge of salt marsh, Killigrew's, *Fernald & Wiegand*, no. 4691; dry cliffs and talus, Tilt Cove, *Fernald & Wiegand*, no. 4690; ledges, talus and gravel by Exploits R., Bishop Falls, *Fernald & Wiegand*, no. 4687; ledges, etc., Exploits R., Grand Falls, *Fernald & Wiegand*, no. 4686; gravelly and turfy strand near Isthmus Cove, Pistolet Bay, *Wiegand, Gilbert & Hotchkiss*, no. 27,435; turfy limestone barrens, Cape Norman, *Wiegand & Long*, no. 27,438; wet spruce, thicket, Flower Cove, *Fernald, Long & Dunbar*, no. 26,323; limestone ledges and gravel, St. Barbe, *Fernald, Long & Dunbar*, no. 26,324; turfy limestone shore, Plum Point, Brig Bay, *Fernald, Long*

& Dunbar, no. 26,325 (approaching var. *unilaterale*); peaty limestone barrens, St. John Isl., *Fernald et al.*, no. 27,436; turfy and gravelly shore, Back (or Bustard) Cove, *Fernald, Long & Fogg*, no. 1282; turfy terraces and slopes, Pointe Riche, *Fernald, Long & Fogg*, no. 1281; wet runs and boggy spots, Ingornachoix Bay, *Fernald & Wiegand*, no. 2680; damp shores, Port Saunders, *Fernald & Wiegand*, no. 2687; serpentine tablelands, alt. 380 m., Bonne Bay, *Fernald & Wiegand*, no. 2684; inside the strand, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2693; shelves and talus of diorite, Western Head, Bonne Bay, *Fernald, Long & Fogg*, no. 1283; dry sandy soil near sea-level, Bay of Islands, *Eames & Godfrey*, no. 5878; sea beach, Little River, *Mackenzie & Griscom*, no. 11,178. QUEBEC: limestone terraces, Blanc Sablon ("Labrador"), *Fernald & Wiegand*, no. 2689; grassy hillside, R. à la Truite, Brest, *St. John*, no. 90,169; sandy isle



Map 16. Eastern Range of AGROPYRON TRACHYCAULUM, var. MAJUS.

in R. St. Augustin, *St. John*, no. 90,168; grassy shore, Pointe au Maurier, Charnay, *St. John*. no. 90,170; grève de cailloutis calcaire, Lac Salé, Anticosti, *Victorin & Rolland*, no. 24,772; cailloutis calcaire, R. la Loutre, Anticosti, *Victorin & Rolland*, no. 24,773 (transition to var. *unilaterale*); sur les platières, R. Chicotte, Anticosti, *Victorin & Rolland*, nos. 27,890, 27,892; platières calcaires, R. MacDonald, Anticosti, *Victorin, Rolland & Louis-Marie*, nos. 20,553, 20,557, 20,559; falaises de la Montagne Saint-Alban, Cap Rosier, *Victorin et al.*, no. 17,834; calcareous walls of Grande Coupe, Percé, *Fernald & Collins*, no. 917, *Victorin et al.*, no. 17,833; calcareous alpine meadow, alt. 1000–1125 m., Table-topped Mt., *Fernald & Collins*, nos. 368, 372; subalpine meadows (alt. 1200 m.), Mt. Au Clair, Tabletop Mts., *Fernald & Smith*, no. 25,467; boggy spots at 1000 m., tableland of Mt. Albert, *Fernald & Collins*, no. 35; crevices and talus of serpentine, Lac au Diable, Mt. Albert, *Fernald & Collins*, no. 411; dans le massif de

serpentine, Ruisseau des Neiges, *Victorin et al.*, no. 17,829; dry schistose crests and talus, alt. 850–1000 m., Mt. Logan, *Pease & Smith*, no. 25,466; alluvial islands at mouth of Bonaventure R., August 4, 1904, *Collins, Fernald & Pease;* gravelly shore of St. Lawrence, Cacouna, August 8, 1902, *Fernald;* vicinity of Cap à l'Aigle, *J. Macoun*, nos. 68,978 (type of *A. caninum*, var. *tenerum*, f. *Fernaldii* Pease & Moore; consequently, of *A. trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte), 68,979 (cited by Malte as var. *glaucescens* Malte); 68,981 (green state). Magdalen Islands: sandstone bluffs, Grosse Isle, *Fernald, Long & St. John*, nos. 6937 (glaucous), 6938 (green). Prince Edward Island: dry clearing, Indian River, *Fernald, Long & St. John*, no. 6943. Nova Scotia: barrens, St. Paul I., *Perry & Roscoe*, no. 77; thicket bordering salt marsh, Villagedale, *Fernald, Long & Linder*, no. 20,104; rocky and gravelly beach (brackish), Eel Lake, *Fernald, Bean & White*, no. 20,101; brackish marsh, Abram R., *Fernald, Bean & White*, no. 20,103; thin open humus (on basalt), North Mt., Belle Isle, *Fernald, Bartram, Long & Fassett*, no. 23,342. New Brunswick: brackish marsh, Bathurst, *S. F. Blake*, no. 5459; shelves of sea-cliffs (basalt), north of Whale Cove, Grand Manan, *Weatherby & Weatherby*, no. 5490. Maine: Mt. Katahdin, August, 1892, *F. P. Briggs;* slide, West Wall, North Basin, Katahdin, July 13, 1900, *Williams, Fernald;* North Wall, North Basin, Katahdin, *S. J. Ewer*, no. 147; opening by Chimney Pond, Katahdin, *Ewer*, no 241; Mt. Kineo, August 26, 1867, *C. E. Smith;* damp basaltic shingle, Lubec, *Fernald*, no. 1365; calcareous ledges, Kelly Point, Pembroke, *Fernald*, no. 1369; edge of salt marsh, Roque Bluffs, August 6, 1919, *Knowlton;* dry sandy shore, Machiasport, July 25, 1914, *Knowlton;* rocky shore, Matinicus, August 6, 1919, *C. A. E. Long;* rocks along shore, Ocean Point, Boothbay, *Fassett*, no. 234; salt marsh, Wells Beach, July 23, 1898, *Fernald.* New Hampshire: railroad track, Northumberland, *Fernald & Pease*, no. 16,715; "in alpinis Montium Alborum," *Tuckerman;* Oakes Gulf, Mt. Washington, *Faxon, Churchill, Kennedy et al.;* Alpine Garden, Mt. Washington, *Faxon, Pease*, no. 10,600; Fan of Huntington's Ravine, *Pease*, no. 13,898; outlet of Lake of the Clouds, Mt. Washington, *Robinson*, no. 979; Ethan's Pond, Mt. Willey, August, 1877, *Faxon;* summit of Mt. Willard, July 19, 1894, *Williams;* border of rich deciduous woods, North Woodstock, *Fernald*, no. 11,566. Vermont: gravelly bank, Canaan, *Pease*, no. 10,088. Ontario: Pic R., Lake Superior, *Loring;* mouth of Dog R., Lake Superior, *J. Macoun*, no. 176. North Dakota: Devil's Lake, July 16, 1902, *Lunell.* South Dakota: Brookings, June 29, 1897, *Thornber.* Nebraska: Kearney, June 20, 1895, *Rydberg*, no. 2018 (type of *A. pseudorepens* Scribn. & Sm.), *Shear*, no. 272 (topotype of *A. pseudorepens*); Merriman, July 11, 1899, *J. M. Bates;* Broken Bow, alt. 2478 ft., *Pammel*, no. 54; Ravenna, *Pammel*, no. 59; wet valley near Whitman, *Rydberg*, no. 1619. Wyoming: Wood's Landing, Albany Co., *Nelson*, no. 3965; Pelican

Creek, Yellowstone Park, *Tweedy*, no. 624. Colorado: Walsenburg, Huerfano Co., alt. 6000 ft., *Clements*, no. 81; South Park, *E. L. Hughes*, no. 11. Nevada: Lone Mt., alt. 8000 ft., Elko Co., *P. B. Kennedy*, no. 4357; Truckee meadows, near Sparks, *Kennedy*, no. 3059. Oregon: 1884, *Cusick*, no. 1134 (type of *A. violaceum*, var. *majus* Vasey; consequently of *A. tenerum majus* Vasey; rachilla as in typical *A. trachycaulum*, but plant otherwise like the common eastern form). Washington: Pullman, *Piper*, no. 1910, in part (mixed with var. *novae-angliae*). British Columbia: Cascade, *J. M. Macoun*, no. 63,388.

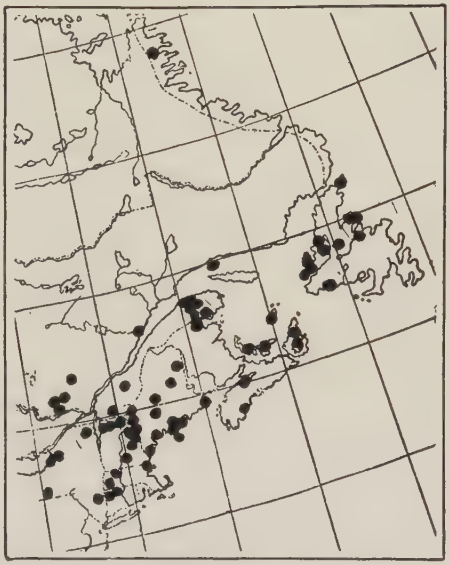
The sheaths, blades or spikes are more or less glaucous in the minor form or state:

A. caninum, var. *tenerum*, f. *Fernaldii* Pease & Moore, l. c., 73 (1910). *A. trachycaulum*, var. *glaucescens* Malte in H. F. Lewis, Can. Field-Nat. xlv. 201 (1931), name only, and Ann. Rep. 1930, Nat. Mus. Can. 45 (1932). *A. trachycaulum*, var. *Fernaldii* (Pease & Moore) Malte, l. c. 46 (1932).

The varietal name *Agropyron violaceum*, *β. virescens* Lange (1880) can hardly be taken up, although it is not impossible that Lange may have had our plant. Malte shows, however (pp. 38, 39), that there was great confusion as to its exact identity and that it is now "impossible to say what particular form it was." Although the type of *A. violaceum*, var. *majus*, for the loan of which I am indebted to Professor Hitchcock, has the rachillas scabrous rather than villous, it is otherwise quite like the common eastern plant and, in view of the inconstancy of this character in western material, it does not seem justifiable to reject this earliest available varietal name. The type of *A. pseudorepens* (*Rydberg*, no. 2018) is exactly the common plant of the shores of western Newfoundland and eastern Canada. The topotype (*Shear*, no. 272), collected on the same day, may well have come from the colony with the type. *A. caninum*, var. *Hornemanni* Pease & Moore was based on *Triticum biflorum*, *β. Hornemanni* Koch, which, according to Malte (p. 38), is *A. latiglume*. The plant of Pease & Moore is largely a short-spiked alpine extreme of *A. trachycaulum*, var. *majus*. As to the more or less glaucous phases of the variety which have been separated by Pease & Moore and by Malte, see the discussion on p. 166.

Var. **novae-angliae** (Scribn.), comb. nov. *A. novae-angliae* Scribn. in Brainerd, Jones & Eggleston, Fl. Vt. 9 (name), 103 (1900). *A. tenerum*, var. *novae-angliae* (Scribn.) Farwell, Rep. Mich. Acad. Sci. xxi. 355 (1920). *A. repens*, var. *novae-angliae* Scribn. & Sm. acc. to Farwell l. c. (1920) in synonymy. Plate 243, figs. 7–9, and map 17.—

Acid to calcareous rock and gravel, bogs and open woods, northern Labrador to Alberta, south to Connecticut, southern New York, Michigan, Wisconsin, Nebraska, Colorado and Nevada. The following, selected from a large representation, are characteristic. LABRADOR: on granitic rock, river-delta at head of Nachvak Bay, *Woodworth*, no. 37. NEWFOUNDLAND: gravelly and rocky seashore, Snook's Arm, *Fernald & Wiegand*, no. 4689; bogs, Bishop Falls, *Fernald & Wiegand*, no. 4688; sandy beach, Sandy Lake, *Fernald & Wiegand*, no. 2685; partially shaded limestone escarpments, Burnt Cape, *Fernald & Long*, no. 27,437; gravelly strand, Southeast Arm, Bonne Bay, *Fernald & Wiegand*, no. 2692; serpentine gravel, The Tableland, Bonne Bay, *Fernald, Long & Fogg*, no. 1285; serpentine barrens, Blomidon, *Fernald & Wiegand*, nos. 2686, 2688; sandy flats, mouth of Blomidon Brook, Frenchman's Cove, *Mackenzie & Griscom*, no. 10,103; peaty and gravelly slopes, French (or Tweed) I., *Fernald, Long & Fogg*, no. 65; wet runs and boggy spots in limestone barrens, Table Mt., Port au Port Bay, *Fernald & Wiegand*, no. 2682; meadow in limestone barrens, Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,011; cobbly barrier-beach, Great Barachois (or Barasway Bay), Burgeo and La Poile, *Fernald, Long & Fogg*, no. 66; turfy sand-plain, Sand Beach, west of Burgeo, *Fernald, Long & Fogg*, no. 64. QUEBEC: boggy thicket, Ile Ste Génèvière, Mingan Ids., *St. John*, no. 90, 171; rich wooded banks, R. Ste. Anne des Monts, *Fernald & Collins*, no. 171; on hornblende schist, Mt. Albert, *Fernald & Collins*, no. 405; crevices and talus of serpentine, Ruisseau à la Neige, Mt. Albert, *Fernald & Collins*, no. 416; Coulée d'Approche, Mt. Albert, *Victorin et al.*, no. 17,828; turfy and mossy slopes, Mt. Fortin, *Fernald & Pease*, no. 24,910; gravelly beaches and flats of Bonaventure R., August 5–8, 1904, *Collins, Fernald & Pease;* gravel beaches and bars, Little Cascapedia R., July 29 and 30, 1904, *Collins, Fernald & Pease;* platières, R. Petite Cascapedia, *Victorin, Rolland &*



Map 17. Eastern Range of AGROPYRON TRACHYCAULUM, var. NOVAE-ANGLIAE.

Jacques, no. 33,282; trap cliff, Tracadigash Mt., Carleton, July 24, 1904, *Collins, Fernald & Pease;* shore, Tadousac, August 6, 1892, *Kennedy;* Cache R., Lac Tremblant, August 2, 1922, *Churchill;* Perkins, Papineau Co., *Malte*, no. 119,241; Mt. King, près de Hull, *Victorin*, no. 15,261; Blue Sea Lake, Hull Co., *Malte*, no. 119,246; Wakefield, *Malte*, no. 119,239; dry serpentine ledges and gravel, Black Lake, *Fernald & Jackson*, no. 12,027; ledges, Mt. Elephantis, Brome, July 30, 1902, *Churchill, Pease.* Magdalen Islands: sandy sea-strand, Alright I., *Fernald, Long & St. John*, no. 6936. Prince Edward Island: moist rich woods and springy larch swamp, Bloomfield, *Fernald, Long & St. John*, nos. 6940, 6941; larch swamp, Dundee, *Fernald, Long & St. John*, no. 6942. Nova Scotia: rocky flood-plain of Barrasois R., *Nichols*, no. 339; crest of boulder and gravel barrier-beach, Great Bras d'Or, Grand Narrows, *Fernald & Long*, no. 20,106; talus of gypsum cliffs near Fivemile R., *Pease & Long*, no. 20,102; sea-shore thicket, Port Mouton, *Bissell & Graves*, no. 20,105. New Brunswick: Dalhousie, *Malte*, no. 119,247. Maine: cedar swamp, Blaine, September 7, 1896, *Fernald;* Caribou bog, Crystal, August 16, 1900, *Fernald;* rock-shelves, Mt. Kineo, *Cushman*, no. 1909; dry bank, Dead River, *Fernald*, no. 576 (type of *A. caninum*, var. *Hornemanni*, f. *pilosifolium* Pease & Moore); dry rocky woods, Lubec, *Fernald*, no. 1366; granite ledges, Jordan Bluffs, Mt. Desert I., *Stebbins*, no. 625; ledgy shore, Dark Harbor, Islesboro, *Woodward, Bissell & Fernald*, no. 8817; Elwell Point, South Thomaston, *Bissell, Fernald & Chamberlain*, no. 8818; beach, Monhegan Island, August 8, 1921, *Churchill;* rocky woods, York, *Fernald & Long*, no. 12,732. New Hampshire: dry open ledges, Diamond Peaks, Dartmouth College Grant, *Pease*, no. 10,501; dry shaded cliffs, Devil's Slide, Stark, *Pease*, no. 17,448; dry roadside, West Milan, *Pease*, no. 13,791; dry gravelly soil, Gorham, *Pease*, no. 12,208; copse, Randolph, *Pease*, no. 1730; roadside, Whitefield, *Pease*, no. 14,426; talus, Mt. Webster, *Pease*, no. 11,722; roadside, Carroll, *Pease*, no. 16,590; among rocks, Jackson, July 10, 1880, *J. A. Allen;* dry woods, Three Mile I., Meredith, *Pease*, no. 2515; in sphagnum, Alstead, *Fernald*, no. 240. Vermont: Willoughby Mt., *Eggleston*, no. 2177 (from type station, acc. to label); Willoughby cliffs, August 10 and 12, 1883, July 24, 1886, *Faxon;* North Slide, Willoughby Mt., August 15, 1896, *Faxon;* base of Willoughby Mt., July 3, 1894, *Grout & Eggleston*, August 1, 1894, *Williams;* 4th of July Slide, Willoughby, July 1, 1896, *Kennedy*, August 15, 1896, *Faxon;* Smuggler's Notch, Mt. Mansfield, August 9, 1877, *Faxon*, July 10, 1894, *Eggleston;* dry ledge, South Burlington, June 27, 1912, *Knowlton.* Massachusetts: Pettingill's swamp, Newbury, August 12, 1897, *A. A. Eaton;* rocky woods, Shelburne Falls, July 6, 1921, *Churchill;* limestone hill near Harmon Pond, Sheffield, *Hoffmann.* Connecticut: dry rocky woods (granitic), Sharon, *Weatherby*, no. 4799; dry rocky open woods (granitic), Canaan, *Weatherby*, no. 4145. New York: Wallface Mt., alt. 3000 ft., *House*,

no. 9533; Dutchess Co., *Hoysradt;* Watertown (as *A. repens,* var. *glaucum*) *A. Gray,* N. Am. Gram. Cyp. no. 128; Brownsville, June 30, 1859, *Wm. Boott;* dry open woods, Danby, *Eames & MacDaniels,* no. 3564. ONTARIO: Britannia, *Malte,* no. 119,242; Kingston, July 27, 1897, *Fowler;* Peninsula, Lake Superior, *Malte,* no. 107,866. MICHIGAN: Isle Royale, *Cooper,* no. 176; Alpena, July 22, 1876, *H. Gillman;* Cheboygan, August, 1890, *Kofoid.* WISCONSIN: Solon Springs, August 14, 1915, *Allen & Davis.* MANITOBA: Lake Winnipeg Valley, 1857, *Bourgeau.* MINNESOTA: sand, aspen grove, North Boundary, Hubbard Co., *M. L. Grant,* no. 2915; Duluth, August 1, 1888, *Vasey* (type of *A. tenerum ciliatum* Scribn. & Sm., consequently of *A. tenerum trichocoleum* Piper, *A. caninum,* var. *tenerum,* f. *ciliatum* (Scribn. & Sm.) Pease & Moore and *A. trachycaulum,* var. *trichocoleum* (Piper) Malte; type in U. S. Nat. Herb.). SASKATCHEWAN: Whitehorse Lake, *Herriot,* no. 72,890; Carleton House, *Richardson.* SOUTH DAKOTA: Belle Fourche, *Griffiths,* no. 389a. NEBRASKA: Loup City, *J. M. Bates,* no. 5219. ALBERTA: Cataract Creek, *S. Brown,* no. 1482; Edmonton, *Malte,* no. 151,819; near Banff, July 14, 1891, *J. Macoun.* WYOMING: Pine Bluffs, *Nelson,* no. 3628, in part; steep slopes, Bridger Peak, *Goodding,* no. 1939; Bull Camp, Big Horn Mts., *T. A. Williams,* no. 2771. COLORADO: Arboles, *Baker,* no. 145; vicinity of Mt. Carbon, *Tidestrom,* nos. 3918, 4041. NEVADA: Ruby Valley, alt. 6000 ft., *Watson,* no. 1330; grassy flats, alt. 6300 ft., Gold Creek, *Nelson & Macbride,* no. 2096.

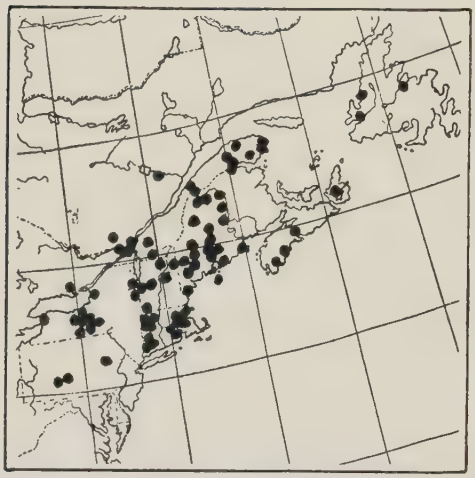
The individuals with trichomes present on some sheaths or blades have been called:

A. tenerum ciliatum Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 30 (1897). *A. tenerum trichocoleum* Piper, Bull. Torr. Bot. Cl. xxxii. 546 (1905). *A. caninum,* var. *tenerum,* f. *ciliatum* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 72 (1910). *A. caninum,* var. *Hornemanni,* f. *pilosifolium* Pease & Moore, l. c. 75 (1910). *A. trachycaulum,* var. *trichocoleum* (Piper) Malte, Ann. Rep. 1930, Nat. Mus. Can. 45 (1932).

The frequent glaucous state has apparently received no special designation.

Var. GLAUCUM (Pease & Moore) Malte, Ann. Rep. 1930, Nat. Mus. Can. 47 (1932). *A. caninum,* f. *glaucum* Pease & Moore, RHODORA, xii. 71 (1910). *A. trachycaulum,* var. *caerulescens* Malte, l. c. (1932). PLATE 244, FIGS. 1–4, and MAP 18.—Rocky or gravelly shores, thickets, open woods and bogs, in basic to acid soils, Newfoundland to southern British Columbia, south to southern New England, Pennsylvania, Michigan, Wisconsin, Minnesota, Nebraska, Colorado, Nevada and California. From a large representation the following are cited as characteristic. NEWFOUNDLAND: ledges, talus and gravel by Exploits R., Bishop Falls, *Fernald & Wiegand,* no. 4684; shelves and talus of diorite cliffs, Western Head, Bonne Bay, *Fernald, Long &*

Fogg, no. 1284; boggy woods, Stephenville, *Fernald & Wiegand*, no. 2691. Quebec: St. John (or Douglastown) R., August 23, 1904, *Collins, Fernald & Pease;* sur les graviers, R. Dartmouth, *Victorin et al.*, no. 17,832; gravelly beach of R. Ste. Anne des Monts, *Fernald & Collins*, nos. 170, 170a; gravelly beaches and flats, Bonaventure R., August 5–8, 1904, *Collins, Fernald & Pease;* sur les graviers de la rivière, Matapedia, *Victorin*, no. 26,464; slaty ledges by Matapedia R., Assemetquagan, *Fernald & Pease*, no. 24,911; rocky bank, St. Alphonse, Chicoutimi Co., August 6, 1902, *Williams & Fernald;* margin of Bic R., Bic, *Fernald & Collins*, no. 915; Rivière du Loup, 1860, *Chas. Pickering*, July 21, 1861, *Wm. Boott;* Anse à Persil, Rivière du Loup, *Victorin*, no. 98; shore of Boundary Lake, Kamouraska, July 31, 1878, *Pringle, Horsford;* Buckingham, *Malte*, no. 119,244; Ile Lemieux, R. Ottawa, *Victorin*, no. 15,262; pinière de la Trappe, Oka, *Victorin & Rolland*, no. 33,140; dry woods, Mt. Beloeil, *Pease*, no. 12,953; Elephantis Landing, Brome, *Pease*, no. 147. Nova Scotia: thicket at upper border of gravel beach, Great Bras d'Or, Kidstone I., *Fernald & Long*, no. 20,100; thickets and upper border of shingly beach, Shubenacadie Grand Lake, *Fernald, Bartram & Long*, nos. 23,338, 23,339; wet thickets and swales, Lahave R., Bridgewater, *Fernald & Long*, no. 23,341; crest of barrier beach, East Jordan, *Fernald & Long*, no. 23,340. New Brunswick: Junction of Matapedia and Restigouche Rivers, *Malte*, nos. 119,249, 119,251; Grand Falls, August 13, 1873, *Wm. Boott;* Lily Lake, St. John, August 10, 1873, *Wm. Boott.* Maine: shore of St. John R., Fort Kent, *Pease*, no. 2579; gravelly shores, Aroostook R., Fort Fairfield, *Fernald*, no. 196; cedar swamp, Mars Hill, *Fernald*, no. 575; recent clearings and railroad embankments, Houlton, *Fernald & Long*, no. 12,728; open woods, City Camp to Roebar's, Wassataquoik R., July 17, 1900, *Fernald;* argillaceous ledges by Penobscot R., Winn, *Fernald & Long*, no. 12,727; bogs, Oldtown, July, 1890, *F. P. Briggs;* exposed argillaceous ledges along Penobscot R., Hampden, *Fernald & Long*, no.



Map 18. Eastern Range of Agropyron trachycaulum, var. glaucum.

12,731; thicket above springy, limy gravel-beach of St. John R., Township ix, Range 17, Somerset Co., *St. John*, no. 2142; dry river-thicket, Mercer, August 6, 1913, *Knowlton;* open woods, Farmington, *Fernald*, no. 574; thin soil on ledges, Hartford, *Parlin*, no. 1427; calcareous strand, Kelly Point, Pembroke, July 31, 1909, *Fernald*, no. 1367 (TYPE of *A. caninum*, f. *glaucum* Pease & Moore, consequently of *A. trachycaulum*, var. *glaucum* (Pease & Moore) Malte); crevices of dry granite, Kelly Point, Pembroke, *Fernald*, no. 1368; rocks, Winter Harbor, *Stebbins*, no. 3913; deciduous hillside-woods, Dedham, *Fernald & Long*, no. 12,729; granite ledges, Frankfort, *Fernald & Long*, no. 12,730; wet bank in woods, Rockland, *C. A. E. Long*, no. 662; crevices of cliff, Monhegan Island, August 10, 1921, *Churchill;* wooded terrace of Kennebec R., Vassalboro, *Fernald*, no. 12,726; North Berwick, *Parlin*, no. 571. NEW HAMPSHIRE: railroad embankment, Randolph, *Pease*, nos. 16,887, 17,195, 19,847; near Upper Baker Pond, Piermont, August 1, 1908, *Williams*. VERMONT: Willoughby, July 21, 1898, *Kennedy;* Twin Mt., West Rutland, *Eggleston*, no. 2473; serpentine outcrop, Roxbury, July 18, 1916, *E. J. Winslow;* cliffs, North Pownal, August 1, 1898, *Churchill*. MASSACHUSETTS: Major Heywood path, Concord, July 1, 1859, *H. D. Thoreau;* Conantum Cliff, Concord, *E. S. Hoar;* dry rocky (diorite) hillside-woods, Horn Pond Hill, Woburn, *Fernald & Long*, no. 8815; rock in woods, Stoneham, July 4, 1894, *W. P. Rich;* High Rock woods, Needham, June 22, 1890, *T. O. Fuller;* damp thicket east of Morse's Pond, Wellesley, July 20, 1912, *Wiegand;* Neponset meadows, Canton, June 22, 1899, *Kennedy;* woods, Ashfield, July 19, 1909, *Williams;* dry rocky upland woods, North Adams, *Fernald & Long*, no. 8816; rocky summit, West Stockbridge Mt., July 18, 1911, *Hoffmann;* rocky ledge, slope of Monument Mt., Great Barrington, July 6, 1906, *Hoffmann;* limestone ledge, Sheffield, July 30, 1914, *Hoffmann*. CONNECTICUT: Wauregan, *J. L. Sheldon*, no. 657; dry thicket, Somers, July 20, 1904, *Bissell;* roadside bank, Union, *Weatherby*, no. 4776; moist meadow, Waterbury, *Blewitt*, no. 324; dry ledge, Waterbury, *Blewitt*, no. 3637; low wet field, Brookfield, *Blewitt*, no. 1885; sphagnous swampy meadow, Bethel, *Eames*, no. 10,973. NEW YORK: thin soil on rocks, Peaked Mt., West Fort Ann, July 16, 1918, *Burnham;* Glen Lake, September 20, 1916, *Burnham;* Axton, July 14, 1899, *Rowlee, Wiegand & Hastings;* Watertown, *A. Gray*, N. Am. Gram. Cyp. no. 129; open woods, Thatcher's Pinnacle, Danby, *Metcalf*, no. 5850; dry woods, Estey's Glenn, Lansing, *Metcalf*, no. 5848; dry scrubby hillside, Caroline, *Wiegand*, no. 9283; rocky banks, Enfield, *Metcalf*, no. 5849; open woods, Ithaca, *Metcalf*, no. 5847; Sullivan Hill (on some labels "Crest of Mt. Zoar"), Chemung Co., *T. F. Lucy*, no. 11,603; Penn Yan, *Sartwell;* marl openings, Bergen Swamp, *Wiegand*, no. 9282; Buffalo, *Clinton;* Niagara Falls, July, 1836, *Carey*. PENNSYLVANIA: Pocono Mts., August 2, 1860, *Porter;* (Porter, on his label, also reports it from barrens of Huntingdon Co. and from Blair

Co.). Ontario: dry rocky ground, Hastings Co., June 2, 1865, *J. Macoun;* beach of Agawa R., Frater, *Pease,* no. 18,068. Michigan: Isle Royale, *Cooper,* no. 175; bluffs, Keweenaw Co., *Farwell,* no. 760; Sulphur I., Thunder Bay, July 13, 1895, *C. F. Wheeler;* low sandy woods, Bay Port, September 10, 1902, *C. R. Ball;* very dry and poor ground in woods, Sand Point, Huron Co., *C. K. Dodge,* no. 22; Jackson, July 11, 1838, *Houghton.* Wisconsin: beach of L. Michigan, Sturgeon Bay, *Schuette,* no. 155; Scott, Brown Co., July 10, 1898, *Schuette;* river-bank, Allouez, July 17, 1882, *Schuette;* Beloit, 1860, *T. J. Hale;* Wild Rose, July 3, 1918, *J. J. Davis.* Minnesota: sand, aspen clearing, Clearwater Co., *M. L. Grant,* no. 3119; rocks, Thomson, *Sandberg,* no. 407; wooded slope, sandstone outcrop, Sheldon Valley, *Rosendahl,* no. 3816. Nebraska: wet meadow, near Whitman, Grant Co., *Rydberg,* no. 1617. Alberta: small meadow, Buffalo Prairie, Jasper Park, *J. M. Macoun,* nos. 98,043, 98,044; N. E. Branch of Saskatchewan, *S. Brown,* no. 1497; Banff, *Malte,* no. 108,310 (var. *caerulescens* Malte, cited by him). Montana: East Gallatin swamps, alt. 5000 ft., *Rydberg,* no. 3191. Wyoming: Cache Creek, *Tweedy,* no. 625; Sundance, *T. A. Williams,* no. 2862; Fort Bridger, August 5, 1873, *Porter.* Colorado: Twin Lakes, *J. Wolf,* no. 1168; Canyon City, alt. 5300 ft., Fremont Co., *Shear,* no. 960; dry soil among bushes, alt. 7000 ft., Mancos, *Baker, Earle & Tracy,* no. 440. Idaho: dry soil among rocks, St. Anthony, *Merrill & Wilcox,* no. 130. Nevada: King's Canon, alt. 1700–2000 m., Ormsby Co., *Baker,* no. 1286. California: open woods, Idyllwild, San Jacinto Mts., *M. F. Spencer,* no. 1231. Washington: dry slopes near Conconully, Okanogan Co., *J. W. Thompson,* no. 6941. British Columbia: Cameron Lake, Vancouver I., *W. R. Carter,* no. 950; Comox, Vancouver I., *Malte,* no. 107,855 (type of var. *caerulescens* Malte).

The earliest varietal name applicable to the common American *Agropyron "caninum"* is var. *glaucum,* a bit innappropriate, since most of the material is not strikingly, if at all, glaucous. The common, green and glabrous phases of the plant are:

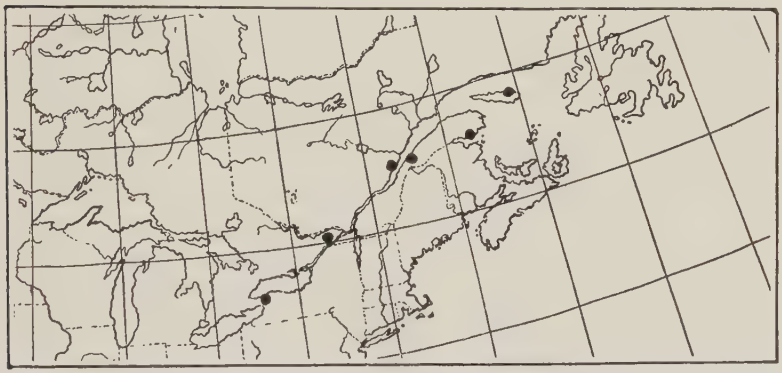
A. caninum of most American authors, not *A. caninum* (L.) Beauv. of Eurasia.

Triticum subsecundum Link, Hort. Bot. Berol. ii. 190 (1833).

Individuals of the green plant with more or less pubescence on some of the sheaths or blades have been called *A. caninum,* f. *pubescens* Pease & Moore, l. c. (1910). The plants examined by them have glabrous culms and variable, though not excessive pubescence on the foliage. They took their name from *A. caninum pubescens* Scribn. & Sm. U. S. Dept. Agric. Div. Agrost. Bull. no. 4: 29 (1897). The type of Scribner & Smith's subspecies, most kindly loaned me by Professor Hitchcock, is a very extreme variation, if not another species, quite

unlike anything else which I have seen: with blades and sheaths all densely villous-tomentose, the tomentum also on the culms. No other material of the aggregate *A. trachycaulum* has been seen with positively pubescent culms. In view of the constancy of this character in species of *Muhlenbergia, Bromus,* and in some other genera of the *Gramineae* the rare western plant deserves further attention.

Var. UNILATERALE (Cassidy) Malte, Ann. Rep. 1930, Nat. Mus. Can. 46 (1932), in part (including name-bringing synonym). *A. Richardsoni* Schrad. Linnaea, xii. 467 (1838). *A. unilaterale* Cassidy, Colo. State Agric. Coll. Expt. Sta. Bull. no. 12: 63 (1890), not *A. unilaterale* Beauv. Agrost. 102 (1812). *A. caninum,* var. *unilaterale* (Cassidy) Vasey, Contrib. U. S. Nat. Herb. i. 279 (1893). *A. caninum,*



Map 19. Eastern Range of AGROPYRON TRACHYCAULUM, var. UNILATERALE.

f. *violascens* Ramaley, Geol. Nat. Hist. Surv. Minn.—Minn. Bot. St. no. 9: 3, 107 (1894). *A. violaceum,* f. *caninoides* Ramaley, l. c. 9, 108 1894). *A. violascens* (Ramaley) Beal, Grasses N. Am. ii. 635 (1896). *A. caninoides* (Ramaley) Beal, l. c. 640 (1896). *A. caninum,* var. *Richardsoni* (Schrad.) M. E. Jones, Contrib. West. Bot. xvi. 18 (1912). *A. trachycaulum,* var. *Richardsoni* (Schrad.) Malte in H. F. Lewis, Can. Field-Nat. xlv. 201 (1931). PLATE 244, FIGS. 5–7, and MAP 19.—Meadows, thickets and limy rocks, borders of Gulf and lower River St. Lawrence, Quebec; Ontario and western New York to British Columbia, south to Wisconsin, Iowa, South Dakota, Colorado, Nevada and Oregon. QUEBEC: sur les platières, Riv. au Saumon, Anticosti, *Victorin & Rolland,* no. 27,886, as *A. repens;* sur les talus secs, R. Natiskotek, Anticosti, *Victorin & Rolland,* no. 27,895 (transition to var. *majus*); alluvial islands at mouth of Bonaventure R., August 4, 1904, *Collins, Fernald & Pease;* sur les ilôts cambriens dits "Les Razades," Trois Pistoles, *Victorin, Rolland & Jacques,* no. 34,008;

vicinity of Cap à l'Aigle, *J. Macoun*, no. 68,982 (approaching var. *glaucum*). MAINE: in agris (doubtless introduced in western wool[1]), North Berwick, June 24, 1898, *Parlin*. NEW YORK: Buffalo, *Clinton*. ONTARIO: Kemptville, *Malte*, no. 119,243. WISCONSIN: railroad track to Murphy's mill, Green Bay, July 8, 1897, *Schuette;* Scott, Brown Co., June, 1885, *Schuette*. IOWA: Little Rock, *C. R. Ball*, no. 554; Jewell Junction, *G. W. Carver*, no. 255. NORTH DAKOTA: prairies, Leeds, July 8, 1901, *Lunell*. SOUTH DAKOTA: Brookings, July 10, 1894, *Thornber*. SASKATCHEWAN: without locality, 1858, *Bourgeau*. ALBERTA: Dunvegan, Peace R., *J. M. Macoun*, no. 59,546; Brazeau, *S. Brown*, no. 1432; Devil's Head Lake, August 3, 1891, *J. Macoun;* Banff, *Butters & Holway*, no. 313. MONTANA: dry hillsides, Hound Creek Valley, alt. 4500 ft., *Scribner*, no. 422 (cotype of *A. Richardsoni ciliatum* Scribn. & Sm., consequently of *A. caninum*, var. *unilaterale*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore and of *A. trachycaulum*, var. *ciliatum* (Scribn. & Sm.) Malte); Dry Fork of Belt Creek, *Rydberg*, no. 3352 (one individual green, one glaucous). WYOMING: Laramie, *E. D. Merrill*, no. 23. COLORADO: wet ground in the higher mountains, near Golden City, *Greene*, no. 446; Veta Pass, 1886, *Vasey;* Dillon, *Shear*, no. 1067; alpine, moist bottoms, Hahn's Peak, Routt Co., *Goodding*, no. 1705. NEVADA: Incline, Lake Tahoe, *P. B. Kennedy*, no. 1439. OREGON: Dale's, Blue Mts., *Griffiths & Hunter*, no. 111. WASHINGTON: Loomis, *Griffiths & Cotton*, no. 340. BRITISH COLUMBIA: Field, *J. Macoun*, no. 64,790; Comox, *J. Macoun*, no. 50.

Individuals with more or less pubescence on at least the lowest sheaths have been called:

A. Richardsoni ciliatum Scribn. & Sm. U.S. Dept. Agric. Div. Agrost. Bull. no. 4: 29 (1897). *A. caninum*, var. *unilaterale*, f. *ciliatum* (Scribn. & Sm.) Pease & Moore, RHODORA, xii. 76 (1910). *A. trachycaulum*, var. *ciliatum* (Scribn. & Sm.) Malte, l. c. 47 (1932).

Although Cassidy seems to have left no type (acc. to personal letter from Professor Ernest C. Smith) to stand for *Agropyron unilaterale*, his description can have been based on nothing else than the long-awned ("2 inches") *A. Richardsoni;* therefore, the inappropriate (or at least undistinctive) name *unilaterale*, as the first one used in the varietal category, has to be maintained.

THE AMERICAN VARIATIONS OF AGROPYRON REPENS.—The ubiquitous *Agropyron repens* (L.) Beauv. is excessively variable and it has repeatedly been segregated into minor species and varieties. As it occurs in North America, apparently indigenous along the coast from

[1] Along with *Bromus marginatus* Nees, *Puccinellia Nuttalliana* (Schultes) Hitchc., *Bouteloua spp., Chloris spp., Sporobolus spp.; Monolepis chenopodioides* Moq., *Lappula Redowskii* (Hornem.) Greene, var. *occidentalis* (Wats.) Rydb., *Aster frondosus* (Nutt.) T. & G., *Hymenatherum aureum* Gray and many other western plants thus locally introduced.—See J. C. Parlin, RHODORA, vi. 81 (1904).

Newfoundland and the lower St. Lawrence to New England and introduced as an obnoxious weed in eastern Canada and the northeastern States and to a minor degree in the Northwest, it appears in several striking forms. Although conspicuous in their extremes, these all seem to intergrade; and essentially all of them may have either green or glaucous or pilose- or glabrous-sheathed phases. Such divergences are often very striking to the eye but as these tendencies are found indiscriminately in the awnless or long-awned, broad-glumed or narrow-glumed forms of the species I cannot look upon them as of taxonomic importance comparable with the variations of the spikelets.

Two very marked trends occur in the glumes. In the majority of weed-colonies in the East the glumes are oblong to narrowly elliptic and broadly scarious-margined (PLATE 245, FIGS. 1 and 2). In the larger mass of material of the sea-beaches, though sometimes in the weedy plants of the interior, the glumes are lanceolate and prolonged from near the middle to the tapering tip and with narrower or inrolling margins (FIGS. 3 and 4). In each of these series the rachis may be glabrous or pilose and the lemmas awnless or long-awned. It is, therefore, very difficult to interpret the many European descriptions which, emphasizing one point (the pilose rachis or the presence of awns, for instance), ignore the others. But, since it is desirable to have some names by which to designate our forms, I am appending the following wholly tentative arrangement of them, distinctly understanding that the names may eventually have to be altered, when a series is closely studied in connection with the European types. The two major trends I am treating as true varieties; the parallel variations under them seem better considered as forms.

a. Glumes oblong, rounded or rather abruptly narrowed at apex, with broad scarious margin....*b.*
  b. Rachis glabrous except for ciliate edges....*c.*
    c. Glumes and lemmas blunt, acute or merely subulate-tipped.....*A. repens* (typical).
    c. Glumes or especially the lemmas definitely awned..Forma *aristatum.*
  b. Rachis pilose or hirsute....*d.*
    d. Glumes and lemmas blunt, acute or merely subulate-tipped.....Forma *trichorrhachis.*
    d. Glumes and lemmas definitely awned.....Forma *pilosum.*
a. Glumes lanceolate, gradually tapering from near the middle to the apex; margin narrow or inrolled....*e.*
  e. Rachis glabrous except for ciliate edges....*f.*
    f. Glumes and lemmas blunt, acute or merely subulate-tipped Var. *subulatum.*
    f. Glumes and especially the lemmas definitely awned Forma *Vaillantianum.*
  e. Rachis pilose or hirsute....*g.*

g. Glumes and lemmas blunt, acute or merely subulate-tipped.....Forma *heberhachis.*
g. Glumes and lemmas definitely awned.....Forma *setiferum.*

A. REPENS (L.) Beauv. Agrost. 146 (1812). *Triticum repens* L. Sp. Pl. i. 86 (1753).—Gravelly coast, Newfoundland and eastern Quebec to Maine; a dominant and aggressive weed south to southern New England and west to Minnesota and Iowa; Alaska to California. (Eu.) PLATE 245, FIG. 1.

Forma ARISTATUM (Schum.) Holmb. Skand. Fl. hft. 2: 274 (1926). *Triticum repens,* var. *aristatum* Schum. Enum. Pl. Saell. ii. 38 (1803).—Coast, Newfoundland and eastern Quebec to southern New England; as a weed inland to Minnesota; Alaska to Oregon. PLATE 245, FIG. 2.

Forma TRICHORRHACHIS Rohlena, Böhm. Ges. Wiss. Math. Nat. Cl. no. xxiv. 5, 8 (1899). *Triticum repens,* var. *β. pubescens* Döll, Fl. Baden. 129 (1857), not M. Bieb. *A. repens,* sub-var. *pubescens* (Döll) Rouy, Fl. France, xiv. 317 (1913). *A. repens,* f. *pubescens* (Döll) Holmb. Skand. Fl. hft. 2: 274 (1926).—Newfoundland and Saguenay Co., Quebec to Connecticut and western New York; Oregon.

Forma **pilosum** (Scribn.) comb. nov. *A. repens,* var. *pilosum* Scribn. in Rand & Redfield, Fl. Mt. Desert, 183 (1894). Gaspé Peninsula, Quebec to Connecticut and Michigan.

The material from Southwest Harbor upon which Scribner based his var. *pilosum* was partly awnless (f. *trichorrhachis*), partly awned. The specimens on the sheet bearing his annotations have long awns and I am designating this material as the type.

Var. SUBULATUM (Schreb.) Reichenb. Ic. Fl. Germ. i. t. xx. fig. 1385 (1834). *Triticum subulatum* Schreb. in Schweig. & Körte, Fl. Erl. i. 143 (1804).—Coast, Newfoundland and Saguenay Co., Quebec to Connecticut; and as a weed south to New Jersey and westward to Minnesota, Iowa and Missouri; Wyoming and Oregon. PLATE 245, FIG. 3.

Forma **Vaillantianum** (Wulf. & Schreb.), comb. nov. *Triticum Vaillantianum* Wulf. & Schreb. in Schweig. & Körte, Fl. Erl. i. 143 (1804). *A. repens,* var. *Vaillantianum* (Wulf. & Schreb.) Reichenb. Ic. Fl. Germ. i. t. xx. fig. 1387 (1834).—Sea-shores, Newfoundland and Magdalen Islands to Massachusetts; and as a weed to Pennsylvania and Wisconsin and in Washington and Oregon. PLATE 245, FIG. 4.

Forma **heberhachis**, f. nov., var. subulato simile, rhachi piloso.—Newfoundland to Rhode Island. TYPE: roadsides, waste places and ballast land, Yarmouth, Nova Scotia, July 24, 1920, *Long & Linder,* no. 20,091 (in Gray Herb.).

Forma **setiferum**, f. nov., forma *Vaillantiano* simile, rhachi piloso.—On the coast, Newfoundland to Long Island, inland to saline soils of western New York. TYPE: Chelsea Beach, MASSACHUSETTS, July 15, 1868, *Wm. Boott* (Gray Herb.).

The Newfoundland specimens of these varieties and forms of *Agropyron repens* before me are the following.

A. REPENS (L.) Beauv. (typical). AVALON PENINSULA: Murray's Pond, 1932, *A. M. Ayre;* INGORNACHOIX BAY: damp shores, Port Saunders, *Fernald, Wiegand & Kittredge*, no. 2679. BAY of ISLANDS: door yard, Frenchman's Cove, *Mackenzie & Griscom*, no. 10,100.

*A. REPENS, f. ARISTATUM (Schum.) Holmb. PORT AU PORT BAY: sand flats back of beach, 4 miles north of Port au Port, *Mackenzie & Griscom*, no. 10,101. BAY ST. GEORGE: dry sand, Stephenville Crossing, *Mackenzie & Griscom*, no. 10,104*a*.

*A. REPENS, f. TRICHORRHACHIS Rohlena. AVALON PENINSULA: roadsides, St. John's, August 4, 1894, *Robinson & Schrenk*. PORT AU PORT BAY: sandy ground back of beach, 4 miles north of Port au Port, *Mackenzie & Griscom*, no. 10,101*a*. BAY ST. GEORGE: dry sand, Stephenville Crossing, *Mackenzie & Griscom*, no. 10,104.

*A. REPENS, var. SUBULATUM (Schreb.) Reichenb. AVALON PENINSULA: Colinet, 1932, *A. M. Ayre*. VALLEY OF THE GANDER: dry gravelly railroad bank, Glenwood, *Fernald, Wiegand & Darlington*, no. 4682. ST.-PIERRE ET MIQUELON: sables et galets maritimes, Dunes du Grand Étang de Miquelon, *Arsène*, no. 84.

*A. REPENS, var. SUBULATUM, f. VAILLANTIANUM (Wulf. & Schreb.) Fern. AVALON PENINSULA: Murray's Pond, 1932, *A. M. Ayre*. BONNE BAY: thicket bordering marl-pond, Storehouse Cove, *Fernald, Long & Fogg*, no. 1279.

*A. REPENS, var. SUBULATUM, f. HEBERHACHIS Fern. BAY OF ISLANDS: wet openings in woods at about 900 ft. alt., Blomidon, *Eames & Godfrey*, no. 5877.

*A. REPENS, var. SUBULATUM, f. SETIFERUM Fern. VALLEY OF THE EXPLOITS: ledges and talus, Grand Falls, *Fernald, Wiegand, Bartram & Darlington*, no. 4683.

(*To be continued*)

CALLITRICHE ANCEPS IN NEW ENGLAND.—In 1908 I described from mountain-ponds of the Gaspé Peninsula a tiny *Callitriche*, as *C. anceps*, RHODORA, X. 51 (1908). Subsequently *C. anceps* has proved to be a generally distributed species in boreal eastern America: Greenland, the Labrador Peninsula, Newfoundland and the Gaspé Peninsula. A heretofore unidentified collection by the late *Charles E. Faxon* from Lake of the Clouds, Mt. Mansfield, Vermont, August 6, 1877, now brings the range of *C. anceps* into New England and the United States. It is desirable to search for it in the subalpine ponds of Mt. Katahdin, the White Mountains and the Adirondacks. In the original

discussion the following possibly helpful phrase occurs: "distinguished from *C. heterophylla* by its small size, uniform foliage, ancipital stem, and promptly deciduous styles." Subsequently plants with dilated foliage have been found but the ancipital stems and caducous styles are distinctive.—M. L. Fernald.

Epidemic among Zostera Colonies—In a previous note[1] the writer drew attention to a widespread destruction of *Zostera marina* var. *stenophylla* Aschers. and Graeber[2] with which he was familiar on the New England coast. It appears that the New Jersey area suffers quite as much as the more northern parts of the coast from this destruction, and the matter has received some notice from the public press[3] as of critical importance in connection with the usefulness of the great coastal feeding areas for ducks and similar birds. In Canada this has attracted much attention.[4] The condition is described as a disease of unknown origin, and subsequent repopulation of denuded areas is reported. A point of great interest is the fact that this condition has appeared in Europe on the form of Zostera native there, with much the same destructive effect.[5] Here it appeared in 1931 in the region of St. Malo and involves colonies all along the Atlantic French and Netherlands coasts. A bacterial organism has been isolated from the diseased plants which may be the cause of the necrotic phenomena. It is to be hoped that coastal New England botanists will make a careful survey, in 1933, of the areas familiar to them with reference to any spread or contraction of the denuded areas.—Wm. Randolph Taylor, University of Michigan.

[1] Lewis, I. F. and W. R. Taylor. Notes from the Woods Hole Laboratory—1932. Rhodora 35: 153. 1933.

[2] Fernald, M. L. Recent discoveries in the Newfoundland flora. Rhodora 35: 92. 1933.

[3] Cape May (N. J.) "Star and Wave," 5 Jan. 1933, and the Trenton (N. J.) "Times" 30 Jan. 1933, for which references acknowledgement is made to H. G. Richards.

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Volume 35, no. 412, including pages 111–146 and 4 plates, was issued 5 March, 1933.

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Inflorescences, × 1. FIG. 1, AGROPYRON REPENS; FIG. 2, A. REPENS, forma ARISTATUM; FIG. 3, A. REPENS, var. SUBULATUM; FIG. 4, var. SUBULATUM, forma VAILLANTIANUM; FIG. 5, A. PUNGENS.

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